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Abstract

This thesis provides an insight into the Vietnamese diet. To do that the general nutritional status of the population in Vietnam is described and the Vietnamese food guide pyramid is represented. In Vietnam, there are still many severe nutrition problems such as underweight, stunting and wasting. High-risk groups are here young children, women of reproductive age and pregnant women. In the last decades, the nutritional situation in Vietnam became much better, however there is still much room for improvement. Furthermore, the immigration situation in Austria is described and the changes in food habits among immigrants are analyzed. Many studies showed that a migration to a Western country comes often with negative health effects. However, there are several factors which play a role in the dietary behavior of an immigrant. In Austria, the number of immigrants is continuously rising. Amongst them there are many Vietnamese people. To analyze the eating habits of the Vietnamese population in Austria a study with 42 subjects has been conducted. The results and outcomes were compared to the recommendation of D-A-CH 2015. In addition, to have a comparison between the Austrian and the Vietnamese diet, the results were also compared to the latest Nutritional Survey of Austria in 2012.

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1 Introduction

This chapter is meant to provide an overview of the methods used in this thesis.

1.1 Research questions

The following thesis intends to answer these core questions:

1. How is the nutritional status of the population in Vietnam?
2. What are the changes in food habits among immigrants?
3. What are the daily intakes of energy and other nutrients of Vietnamese living in Austria?
4. How is the Vietnamese diet in comparison with the Austrian diet?

1.2 Methodology

To answer those proposed research questions, a literature review was conducted and a study has been performed.

For the first two questions a literature review was needed. Webpages of relevant organizations and scientific databases have been searched thoroughly.
The databases were: Pubmed, Scopus and Sciencedirect.
Search terms were: nutritional survey Vietnam, migration and nutrition, immigrants in Austria, immigrants' food habits, immigrants' eating habits, immigrants' dietary changes, etc.

The result of the research for the first chapter 'The Vietnamese diet' was satisfying. The nutritional survey of Vietnam was easily accessible as well as the Vietnamese food guide pyramid. Altogether enough data for the first chapter was available and the author was quite satisfied.
For the second chapter of the thesis 'Migration and Nutrition' the research proved to be more complicated. It was more difficult to find current studies of food habits among immigrants in Austria. The only relevant studies found were from migrants living in Germany. Therefore unfortunately few data were found and also used.

For the last two questions a study was conducted. The nutrition program GloboDiet was used to capture interviews (24-hours dietary recall) of the subjects, which is the same

that is been used for the Austrian nutrition report. In summation, 84 interviews have been conducted by the author (two of each subject). A detailed description of the program GloboDiet can be found in chapter 4.2.

The evaluation of the interviews from GloboDiet result in an Excel chart. For further evaluation the data has been aggregated into smaller pivot tables. Final analysis has been made with the statistical program SPSS.

The results and outcomes were compared to the recommendation of D-A-CH 2015 and as well to the latest Nutritional Survey of Austria in 2012.

Further details of the study are described in the last part of the thesis.

1.3 Motivation

The topic of this master thesis was chosen, because the author is a Vietnamese immigrant herself. The family of the author moved to Austria because of the consequences of the Vietnam War. So did many other families.

Today, it can be noticed that the number of Vietnamese in Austria is steadily growing. Vietnamese restaurants and supermarkets have been on the rise especially in Vienna and become more and more a trend in Austria. The Vietnamese people themselves have integrated quickly and settled in for good. So, Austrians are willingly eating the food the Vietnamese are preparing and accepting the Vietnamese culture. However, a more interesting question is: How is it the other way around? What are the eating habits of these immigrants? And how much is the migration process affecting an immigrant group, in particular Vietnamese, in their food habits and dietary practices? Furthermore, what are the influencing factors and also the limitations for people moving to a new environment?

Due to the lack of studies analyzing the diet of Vietnamese immigrants in the world and particular in Austria, it seems important to do research and to conduct a study to see how the eating habits of Vietnamese people in Austria are and as well to compare the Vietnamese with the Austrian diet.

2 The Vietnamese diet

In this chapter the general nutritional status of the population in Vietnam is described as well as the Vietnamese food guide pyramid in comparison with the Austrian pyramid.

2.1 General nutritional status in Vietnam

In Vietnam, undernutrition is still one of the main concerns. Children under 5 years old are the most alarming group for undernutrition. The mortality rate for these high-risk group is 16 per 1000 live births, where various forms of undernutrition make up nearly 45% of the deaths. On the other hand, in the last years overweight and obesity have also become a national problem. This is known as the double burden of malnutrition (Chaparro et al. 2014).

Since 2000, Vietnam has shown good progress in reducing stunting. However, stunting is still one of the main problems in Vietnam. One in five children are stunted in Vietnam. Wealth, region and ethnicity play a major role on the outcome. Breastfeeding otherwise has a positive effect, which is why the infant and young child feeding (IYCF) practices should be improved to reduce the high number of stunted children (Chaparro et al. 2014).

Changes in mandatory salt iodization laws in 2005 made iodine deficiency a big concern in Vietnam again. The salt iodization is currently on a voluntary basis, which causes the increase in iodine deficiency in the general population of Vietnam (Chaparro et al. 2014).

Almost a third of children under 5 years and women of reproductive age have anemia. It can be caused by micronutrient deficiencies such as iron and others. In recent years only little progress has been achieved in reducing these numbers, which makes anemia a significant public health concern. The focus should also be on the improvement of infant and young child feeding (IYCF) practices (Chaparro et al. 2014).

This chapter shows a summary of the latest General Nutrition Survey of Vietnam, which has been conducted in 2009-2010. The objective of this General Nutrition Survey was to assess the current nutritional situation and to analysis correlative factors as well as to identify the risk factors of the Vietnamese population (Le & Le 2010).

2.1.1 Nutritional status of children under 5

The General Nutritional Survey showed, that in Vietnam the prevalence of underweight was 17.5% in children under 5 years. The prevalence of stunting was 29.3% and of wasting was 7.1% in children under 5. While the prevalence of undernutrition is decreasing, overweight and obesity has become more and more a national concern in Vietnam (Le & Le 2010).

2.1.1.1 Underweight

There were no significant differences between underweight in girls and boys. However, regional variations were found evident in the prevalence of underweight. The Northern Midlands and Mountain areas, the North Central area and the Central Coastal area, and the Central Highlands have the highest prevalence of underweight. The lowest level of underweight in children under 5 was found in the Red Delta and the South East area (Le & Le 2010).

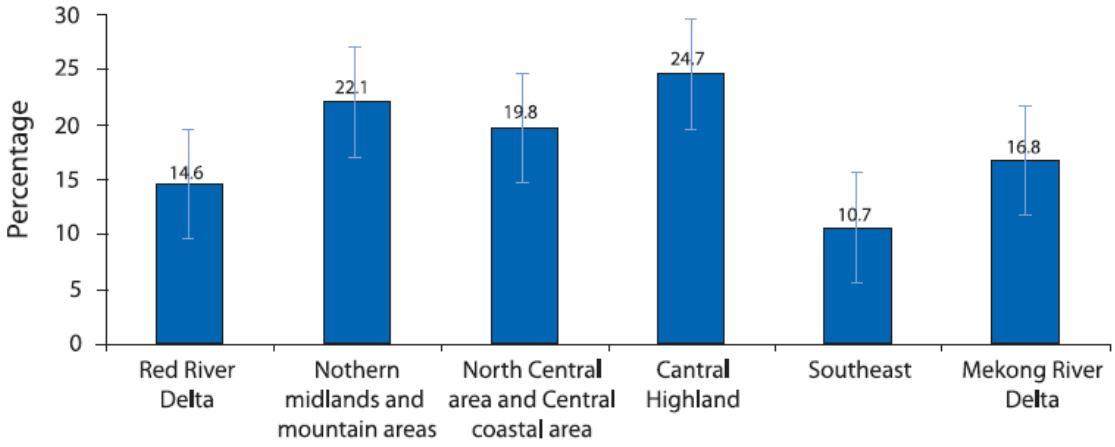


Figure 1: Prevalence of underweight by ecological zones in Vietnam, 2010 (Le & Le 2010)

The Survey has also showed, that the household wealth and the prevalence of underweight is negatively correlated. Comparing the poorest and the richest households, the level of underweight was about 3.4 times higher in the poorest households. That means nearly one quarter of the poor children were underweight.

In large cities compared to small cities and the rural communes the prevalence of underweight showed to be significant lower. Also between different ethnic groups in Vietnam the level of underweight varied largely (Le & Le 2010).

An important factor which points out if a child is more likely to be underweight or not is the condition of the mother pregnant with the unborn. The Survey revealed that shorter women (maternal height less then 145cm) are more likely to have underweight babies than taller ones. There was no difference among both girls and boys. The maternal Body Mass Index (BMI) plays also a key role in the prevalence of underweight in children under 5 years old. Those who are born to women with a low BMI (<18,5kg/m²) are associated with a higher prevalence than those from women with higher BMI. It is also evident that maternal education is related to the prevalence of underweight in children. So, the higher the education of the mother the lower the prevalence of underweight in their child. A similarly pattern was found for household dietary diversity. The prevalence of underweight was almost twice as high for children with low household dietary diversity compared to those with high household dietary diversity (Le & Le 2010).

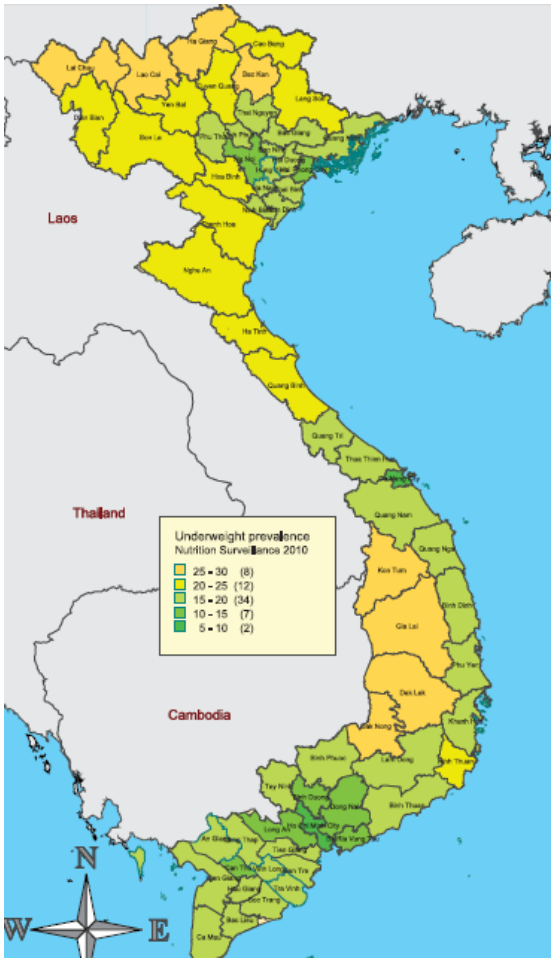


Figure 2: Map of the prevalence of underweight in children under 5 years by province, Vietnam 2010 (Le & Le 2010)

2.1.1.2 Stunting

In Vietnam the prevalence of stunting in children under 5 years old was 29.3%. The prevalence of severe stunting amounted to 10.5%.

Here, the prevalence of stunting in children under 5 also had a great variation between the different ecological zones of Vietnam. Again, the Northern Midland and the Mountain areas, the North Central and the Central Coastal areas, and the Central Highland areas had the highest prevalence of stunting. The lowest level was found in the Red River Delta and the South East areas (Le & Le 2010).

Similarly to underweight, the prevalence of stunting decreased when the household wealth was increasing. Comparing the poorest with the richest household, there was an approximately 3 times higher prevalence of stunting among poor kids. That means, more than one third of the poorest children were stunted. Also here, in “large cities” the level of stunting was significant lower as it was in “small cities” or rural “communes”. The prevalence of stunting also varied between ethnic groups in Vietnam (Le & Le 2010).

Additional factors for stunting in children under 5 is again maternal height, maternal Body Mass Index and maternal education with a similar pattern for underweight. The level of stunting was also 1.5 times higher in children with a low household dietary diversity compared to those with high household dietary diversity (Le & Le 2010).

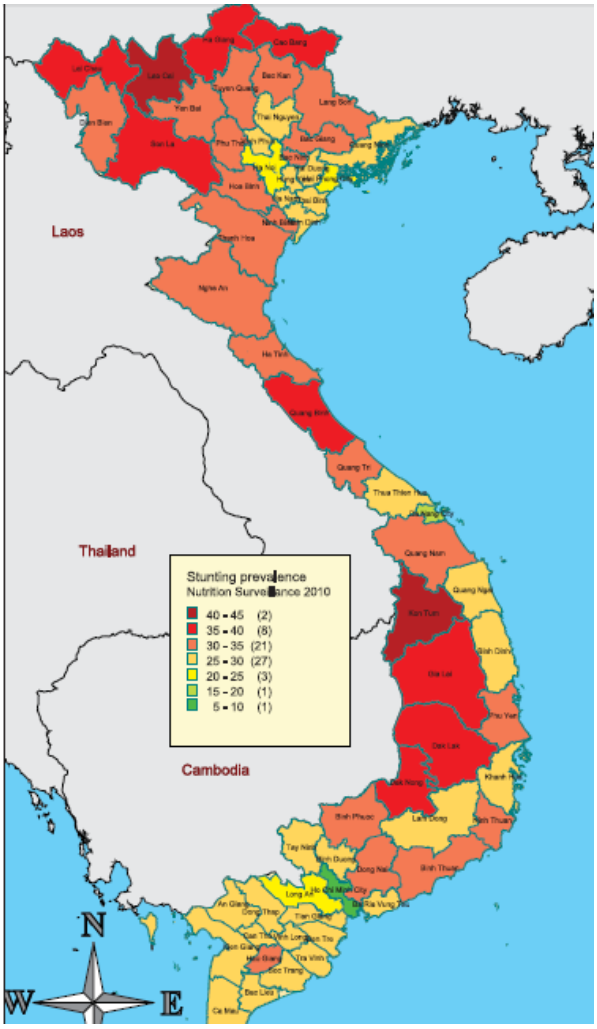


Figure 3: Map of the prevalence of stunting in children under 5 years by province, Vietnam 2010 (Le & Le 2010)

2.1.1.3 Wasting

The prevalence of wasting in children under 5 years old was found to be 7.1% in Vietnam. The Survey revealed a prevalence of severe wasting at 3.8%.

They found here also a variation in the different regional zones in Vietnam and the level of wasting. Again, the Northern Midland and Mountain areas, the Central Highland, and the North Central and the Central Coastal areas showed high prevalence of wasting. The lowest level of wasting was in the South East and the Red River Delta areas (Le & Le 2010).

Also the household wealth showed again an association with the prevalence of wasting. There was an approximately two times higher level in the poorest households in comparison with the richest ones. However, the prevalence were quite similar for

children in poor and middle level households. In the urban households the level of wasting was as well significantly lower than in rural households.

Among ethnic groups in Vietnam it was found evident that there was a great variation in the prevalence of wasting in children (Le & Le 2010).

Similar to the levels of underweight and stunting, the factor maternal BMI had a related effect on the prevalence of wasting. Another associated factor is the maternal education. A higher maternal BMI and/or a higher maternal education was associated with a lower level of wasting in children under 5 (Le & Le 2010).

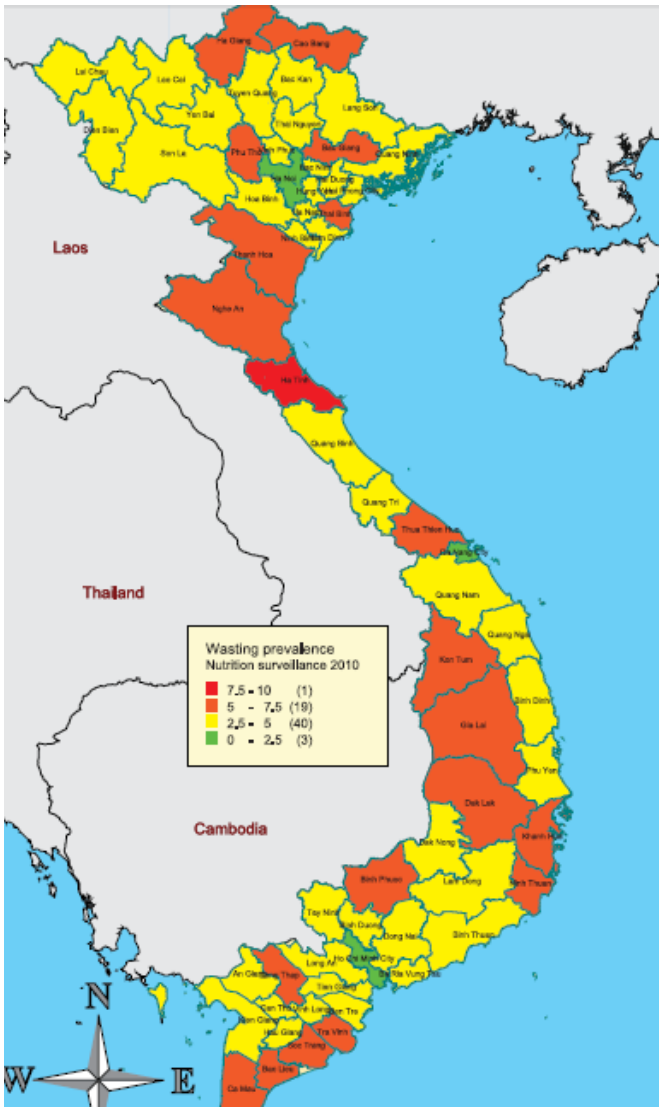


Figure 4: Map of the prevalence of wasting in children under 5 years by province, Vietnam 2010 (Le & Le 2010)

2.1.1.4 Trends of undernutrition in children under 5:

From 2000 to 2010, the prevalence of underweight has significantly decreased. Over the 10-year-period, the average reduction rate amounted to 1.26% per year.

For children in Vietnam the prevalence of stunting has also shown a steady reduction in the last 10 years, which is similar to underweight. Here, the average reduction rate was 1.4% per year (Le & Le 2010).

There was no significant evidence of improvement for the prevalence of wasting in the time period from 2000 to 2010 in children under 5 years. In Vietnam, the prevalence of wasting is considered to be at medium level by the World Health Organization (Le & Le 2010).

The prevalence of overweight (BMI from 25 kg/m² to 29.9 kg/m²) and obesity (BMI over 30 kg/m²) in children under 5 in Vietnam amounted to 5.6%. The level of obesity alone was at 2.8%. In urban areas the prevalence of overweight/obesity was even higher at 6.5% (Le & Le 2010).

2.1.1.5 Conclusion and future prospects:

The data from the General Nutrition Survey 2009-2010 revealed that the nutritional status of children under 5 years old in Vietnam is at a critical point. Even though great progress has been made in this area for the past 10 years, undernutrition is still a major national problem (Le & Le 2010).

Interventions should be targeting to high-risk groups like children under 5 years and women during pregnancy to prevent the consequences of undernutrition as well as malnutrition. In addition, there should be prevention programs with simple communication strategies to reach women with lower educational status. Programs are also needed to counsel parents on how important it is to have a wide dietary diversity of complementary feeding for children from 6 month at age and older. And last but not least, the improvement of the infant and young child feeding practices in Vietnam should be on high focus to reduce the numbers of children with diseases like underweight, stunting and/or wasting (Le & Le 2010).

2.1.2 Nutritional status of children 5 to 19 years old

In Vietnam the prevalence of underweight in children 5-19 years old was 24.2%. The prevalence for severe underweight was 7.2%. There was no significant difference between girls and boys. In comparison with the numbers of children under 5 years old (17.5%, 2.1%) the level for underweight in children 5-19 years old was even higher (Le & Le 2010).

The prevalence of stunting in children 5-19 years old amounted to 23.4%. The level for severe stunting was 7.1%. The result showed that there was a significant difference between girls and boys. The prevalence of stunting and severe stunting for girls was 19.5% and 5.8%. The numbers for boys were 27.5% and 8.6%. So, the prevalence of stunting among boys was higher than among girls of this age. However, compared with children under 5 years (29.3%, 10.5%), the level of stunting was lower in children 5-19 years old (Le & Le 2010).

The result for wasting was 16.8% in children 5-19 years old, and the level of severe wasting was found at 5.2%. There was no significant difference in the findings between girls and boys. Comparing with the children under 5 years old (7.1%, 3.8%) the prevalence of wasting and severe wasting in children 5-19 years old was again much higher (Le & Le 2010).

The prevalence of overweight in children 5-19 years was found at 8.5%. The level of obesity amounted to 2.5%. The result showed a significant difference in the prevalence of overweight and obesity between girls and boys. The numbers were higher for boys (10.2%, 6.8%) than girls (3.2%, 1.8%), but it was only statistically significant for the age group from 5-7 years old (Le & Le 2010).

The findings also showed for children from 5 to 19 years old that as age increased the prevalence of overweight and obesity decreased. But the data also indicated that in the future there will be more overweight and obese children and adolescents in Vietnam (Le & Le 2010).

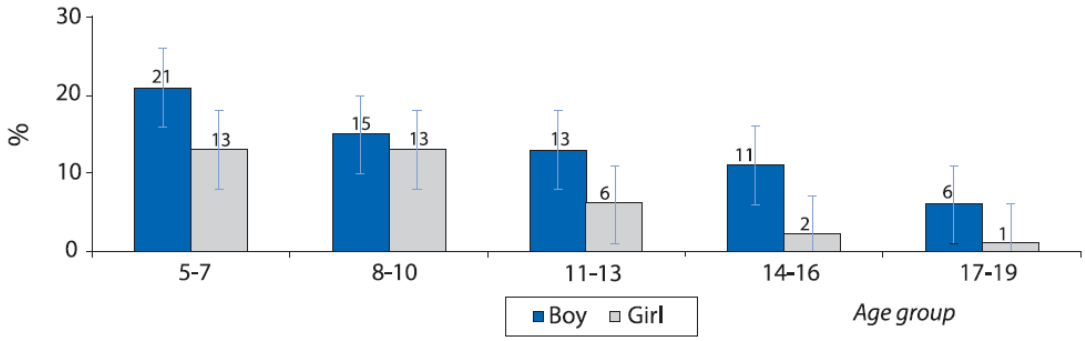


Figure 5: Prevalence of overweight in children from 5-19 years old by age and sex, Vietnam 2009-2010 (Le & Le 2010)

There was no significant variation of the overweight/obesity prevalence in different ecological regions except for the South East, where the level of overweight and obesity was more than double as high as in any other area (Le & Le 2010).

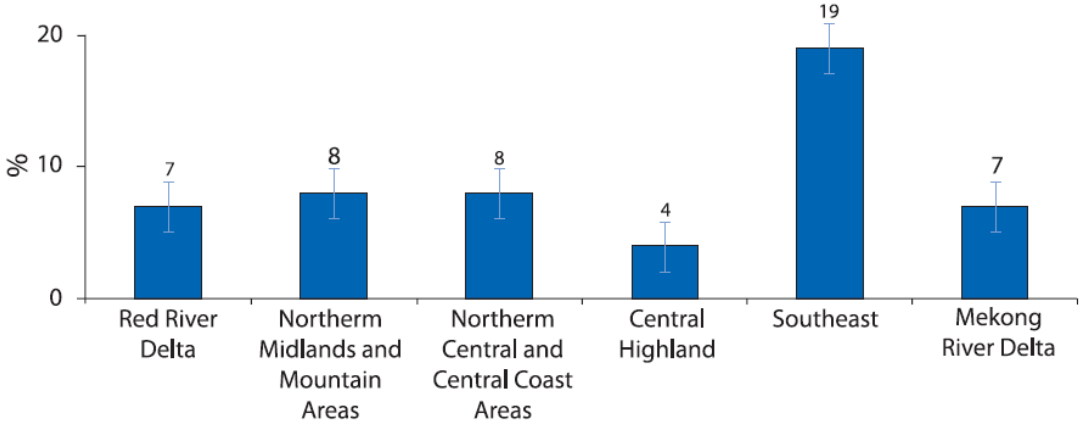


Figure 6: Prevalence of overweight in children from 5-19 years old by ecological zone, Vietnam 2009-2010 (Le & Le 2010)

The result showed a correlation between the maternal Body Mass Index and the prevalence of overweight and obesity in children from 5 to 19 years old. So, children of overweight mothers with BMI >25kg/m² were more likely to get overweight and obese than those children of mothers with BMI <25kg/m² (Le & Le 2010).

The maternal education level was also related to the prevalence of overweight/obesity in children 5-19 years old. The weird fact was, that the prevalence increased when the maternal education increased. So, the overweight/obesity prevalence for children with

mothers with no education was 6.2% and the level for women with secondary education or higher was found at 15.4% (Le & Le 2010).

2.1.2.1 Conclusion

The findings of the General Nutrition Survey 2009-2010 showed that the nutritional status of children from 5 to 19 years old in Vietnam is still at a critical point. It revealed that undernutrition is also in this age group a major national health problem. And the future trends for these age groups will also be a higher prevalence of overweight and obese children and adolescents especially in large cities of Vietnam (Le & Le 2010).

2.1.3 Nutritional status of adults (over 19 years old)

In Vietnam the chronic energy deficiency (CED) is one of the main concerns for adults. CED is defined by BMI under 18,5kg/m².

The prevalence of CED in adults in Vietnam was found at 17.2%. There was a significant difference in the prevalence of CED between the females and males in Vietnam. The CED level in women was at 18.5% and the level for men was found at 15.8% (Le & Le 2010).

Observing the prevalence of CED in 2010 and comparing it with the number of 2000, it was noted that the CED level decreased in almost all age groups. The levels of CED in adults less than 25 years old and over 55 years old were higher than in any other age group (Le & Le 2010).

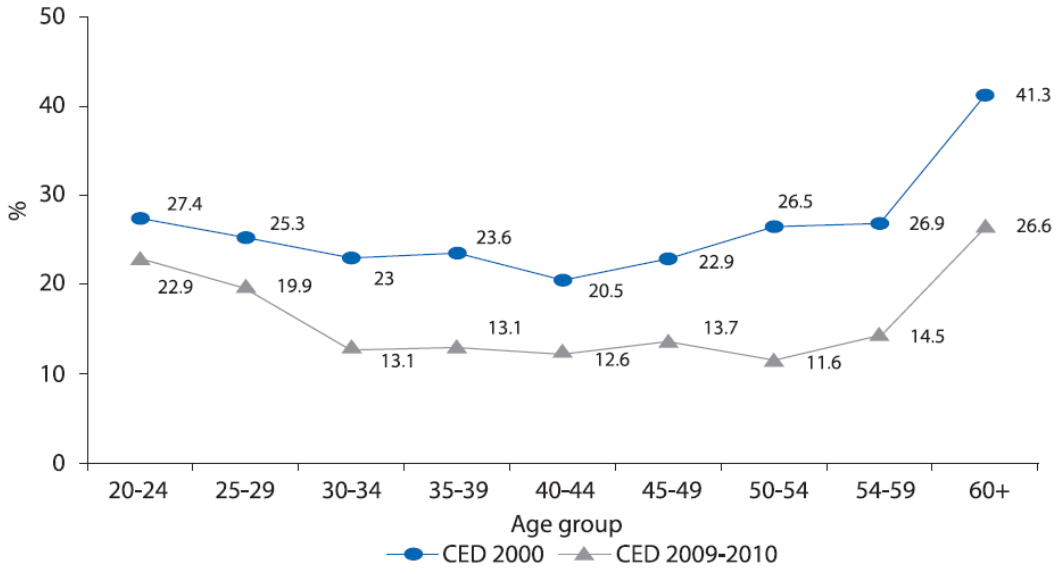


Figure 7: Prevalence of CED in adults over 19 years old in 2000 and 2010 (Le & Le 2010)

The prevalence of overweight and obesity in adults in Vietnam amounted to 5.6%. In the age group of adults from 55 to 59 years old the highest overweight and obesity level was found. For males in this age group the prevalence was 7.8% and for females 10.9%. The prevalence of overweight/obesity was not significantly different between women and men in Vietnam (Le & Le 2010).

In the South East (including Ho Chi Minh City) the highest level of overweight and obesity was found. There the prevalence was 10.7%. The result showed that overweight and obesity was significantly more prevalent in urban areas than in rural areas (Le & Le 2010).

2.1.4 Nutritional status of mothers with children under 5 years old

In Vietnam, there was great progress of reducing malnutrition in children in the past years. But the focus should also be on pregnant women because the nutritional status of mothers has a big impact on the development and future life of their children. So, as an aim of reducing the prevalence of undernutrition in children, the time period of women during pregnancy through the first two years of the child's life should be on focus. Because deficiencies during this critical period are leading to lifelong damages of the child (Le & Le 2010).

According to the World Health Organization, maternal undernutrition is very common in many developed countries. More than 10% of global diseases are accounted to malnutrition in mothers and children (Le & Le 2010).

In 2010, the prevalence of chronic energy deficiency in mothers with children under 5 years old was found at 20.2%. It was observed that the highest CED level was in young mothers aged 15-19 years old. From 2000 to 2010, the prevalence of CED in mothers had decreased slowly with an average reduction rate of 0.65% per year (Le & Le 2010).

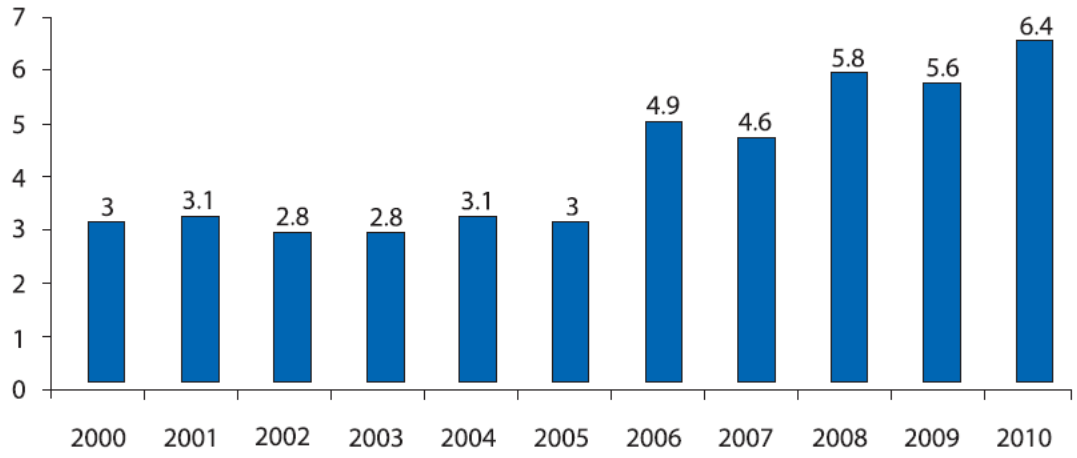


Figure 8: Prevalence of overweight and obesity among mothers with children under 5 years of age between 2000 and 2010 (Le & Le 2010)

Figure 8 indicates that the trend of overweight and obesity in mothers with children under 5 years old was clearly increasing over the years. Compared to 2000, the prevalence of overweight/obesity among mothers had more than doubled in 2010 (Le & Le 2010).

2.1.4.1 Conclusion and future prospects

At the moment, one of five mothers in Vietnam is underweight (CED). So, interventions to increase the nutritional status of mothers should be a high priority to reduce the prevalence of newborns with malnutrition. To make this happen will be a difficult hurdle that Vietnam has to take in the next decade (Le & Le 2010).

2.2 Micronutrient deficiencies and breastfeeding practices

2.2.1 Micronutrient deficiencies

Micronutrient deficiencies like vitamin A, iron and zinc are at high level of public health significance in many countries, including Vietnam. High-risk groups for these deficiencies are particularly children and women of childbearing age (Le & Le 2010).

In Vietnam, the prevalence of anemia was 29.2% and the level of pre-clinical vitamin A deficiency was found at 14.2%. Both were at an average level of public health importance. In recent decades, the prevalence of anemia and vitamin A deficiency had slightly decreased but still remain a major national concern (Le & Le 2010).

The highest prevalence of vitamin A deficiency was found among children in the Highland region at 20.9%. The prevalence of anemia among children in the Northwest area was 43%, which was the highest compared to any other ecological area in Vietnam (Le & Le 2010).

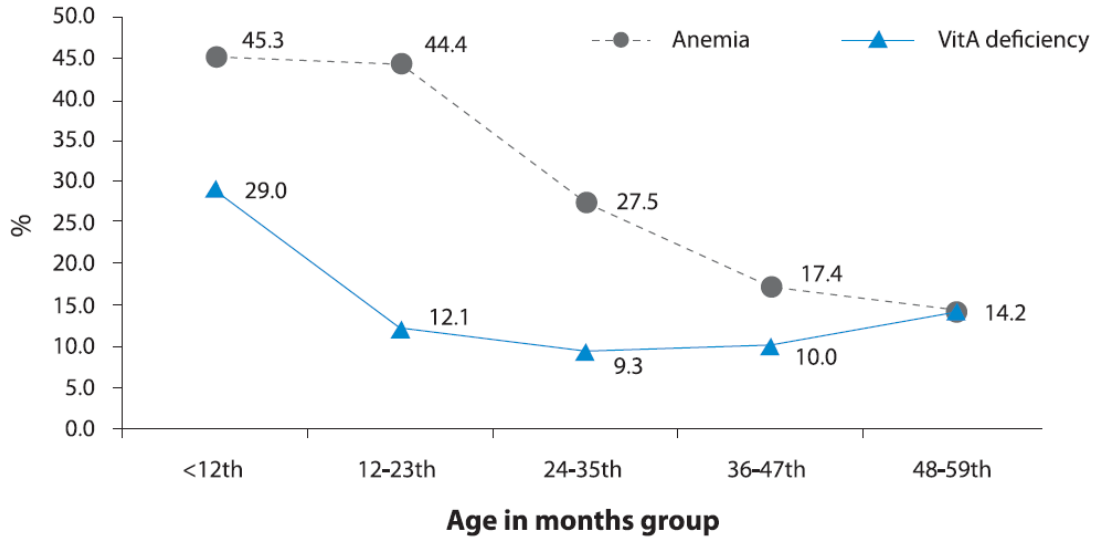


Figure 9: Prevalence of vitamin A deficiency and anemia in children under 5 years old by age group in 2008 (Le & Le 2010)

As seen in Figure 9, the prevalence of anemia decreases significantly with age. The highest percentage of anemia was found in children between 0 to 23 month old at 44-45%. Similarly, the level of vitamin A deficiency was highest in children in the age group less than 12 months old with 29% (Le & Le 2010).

These result revealed that micronutrient deficiencies at this age make these young infants most likely prone to further undernutrition in their future life (Le & Le 2010).

2.2.2 Situation of breastfeeding

It is well known that breast milk has all nutritious ingredients that a newborn needs. Furthermore, it can prevent undernutrition and micronutrient deficiencies in children, and also protect the infant against oxidation. Exclusive breastfeeding in the first six months is as well recommended to prevent children's overweight and obesity. Many studies have shown that breastfeeding is not only beneficial for the child but also for the mother's health (Le & Le 2010).

In Vietnam, the prevalence of exclusive breastfeeding until 6 months of age was 19.6%, which is a very low percentage, knowing all the benefits coming along with breastfeeding. 25.8% did exclusive breastfeeding until 4 months of age, whilst up to 34.6% of children under 24 months old were receiving bottle feeding (Le & Le 2010).

There should be more interventions in Vietnam pointing out the many advantages of breastfeeding over bottle feeding. These programs should ensure that communication is delivered effectively to reach also woman with low education levels (Le & Le 2010).

2.3 Trends in food consumption

In Vietnam in the year 1985, the mean daily food consumption was at 782.2g per capita. In 2009 to 2010, the mean consumption was at 877.2g per capita. So, the General Nutrition Surveys showed that the total daily food intake was slightly increasing over the years, but the difference was not statistically significant. The primary change in food consumption was the increased amount of food from animal sources. So in 1985, the percentage of food intake from animal sources was found at 12%. In 2010, the percentage amounted to 21%. These changes were leading further to a change in the dietary compositions of the Vietnamese (Le & Le 2010).

2.3.1 Changes in food consumption in the General Nutrition Surveys

In addition to the increased energy consumption in total, the dietary composition of the food intake per capita has also changed in Vietnam. Over the decades, the meat and poultry consumption was increasing nearly eight times. So, the mean intake of meat and poultry was only 11.1g per capita and day in 1985, and by 2010 the mean intake of meat and poultry increased to 84g per capita and day (Le & Le 2010).

The daily consumption of fruits per capita was only 2.2g in 1985. In 2010, the daily intake amounted to 60.9g per capita. So, also the total intake of fruits was increasing greatly in Vietnam. The daily fish intake per capita increased as well among the Vietnamese people. So in 1985, the daily fish consumption was 35g per capita and in 2010 it was found at 59.8g per capita. The consumption of egg and milk increased from 0.8g per capita and per day in 1985 to 29.5g per capita per day by 2010. There is an observing trend in the increased intake of milk and milk products in the last years, but the milk

consumption in general still remains low in Vietnam. There is only limited production and storage of milk and milk products in Vietnam, and the imported products are quite expensive, so that only a few numbers of families can afford to buy them. In comparison, the amount of vegetables that were consumed daily among Vietnamese was 214g per capita in 1985, by 2010 the daily intake of vegetables was only 190g per capita. Even though, the total daily consumption of vegetables had decreased, the vegetable consumption was more diversified in the last past years in Vietnam (Le & Le 2010).

2.3.2 Changes in nutrient intake

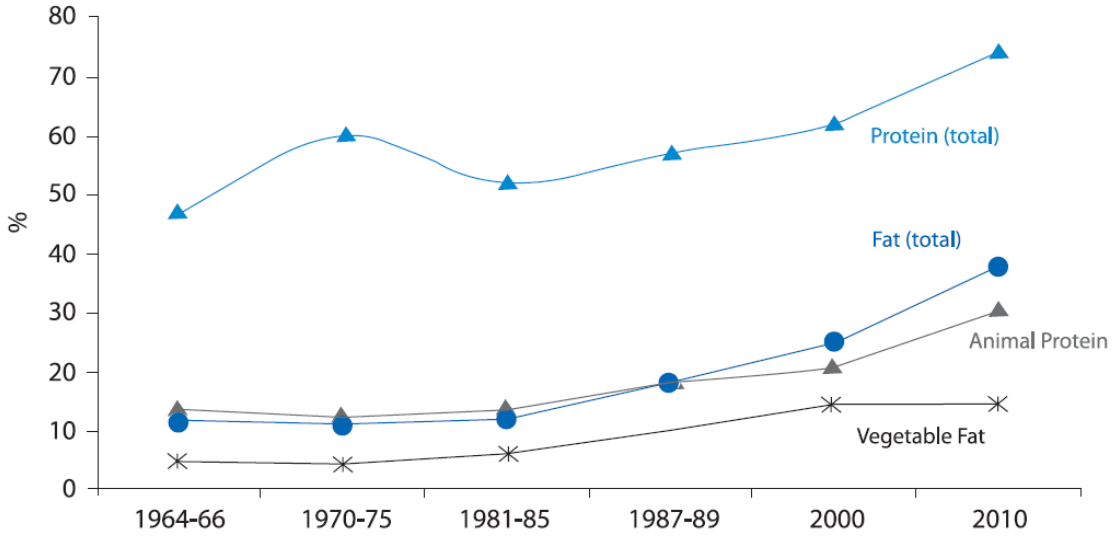


Figure 10: Changes in protein and fat intake in the diet (Le & Le 2010)

In Vietnam, the daily protein intake per capita was slowly increasing over the years. In 1985, the amount of protein consumption was 52g/capita/day. In 2010, the protein intake was found at 74.3g/capita/day. The increased consumption of animal protein in the diet of Vietnamese people had been observed. There were also significant differences in the consumption of protein between urban and rural regions.

Also the daily intake of oil and fat per capita increased gradually from 12g in 1985 to 37.7g in 2010 (Le & Le 2010).

2.3.3 Changes in dietary energy intake and energy proportion

In Vietnam, there had been a remarkable change in the dietary energy intake over the past decades. The proportion of total energy intake had changed from 1985 with 11.2%

from protein, 6.2% from fat and 82.6% from carbohydrates to 15.9% from protein, 17.8% from fat and 66.3% from carbohydrates by 2009. The current energy proportion is noted to be more optimal compared to the previous ratio. These changes in dietary patterns among Vietnamese showed that the food consumption in Vietnam has improved greatly (Le & Le 2010).

2.4 Conclusion and future proposal

The effects of undernutrition in children remain a major problem of public health in Vietnam. Currently, the estimated numbers of undernourished children are: 1.3 million underweight, 2.1 million stunted and about 520,000 wasted. These numbers have great variation between different geographical regions (Le & Le 2010).

The prevalence of overweight and obesity are also on the rise amongst Vietnamese people. The overweight/obesity rate in children, especially in large cities, is even higher than the control level defined by National Nutrition Strategy in 2001-2010 which is at 5%. In 2010, the prevalence of overweight and obesity was 8 times higher than in 2000. The emerging trend here for the future are increasing levels of overweight and obese people (Le & Le 2010).

Initiatives for reducing stunting in children should be focusing throughout the critical time period during pregnancy and the first two years of a child's life. These programs should be aimed at poor households and mothers with poor nutritional and educational status. Also geographical areas with high stunting rates should get high attention (Le & Le 2010).

Another issue of big national importance are the micronutrient deficiencies. Iron deficiency anemia is one of the leading causes of maternal mortality and stunting in children in Vietnam. The prevalence of anemia is highest among children under 5 years old, women of reproductive age and pregnant women. Pregnant women with anemia are at very high risk of mortality among their newborns and as well themselves (MDG Achievement Fund 2013).

Strategies to reduce micronutrient deficiencies should be implemented by enhancing the food diversity on intakes. Hence, the intakes of micronutrient in children and the

general population will increase and prevent them from micronutrient deficiencies (MDG Achievement Fund 2013).

Maternal nutrition during pregnancy plays a significant role in the development of a child's future life. Nutrition counseling services should be provided to parents, in particular mothers, on the importance of maternal nutrition during pregnancy and after birth to reach the recommended levels of nutrient intake. Also breastfeeding practices and adequate complementary feeding should receive specific focus in these programs to improve the nutrient intake of infants. The target groups for these interventions are children under 5 years old, women of reproductive age and pregnant woman (Le & Le 2010).

In the past 30 years, there has been a remarkable change in the proportion of total energy intake. The current ratio of protein, fat and carbohydrate intake is considered to be relatively ideal. Food consumption in the general population of Vietnam has improved greatly over the decades. Nonetheless, an update of nutritional guidelines is required to adapt recent social and economic changes in order to avoid overcompensation leading to overweight and other conditions which will have a negative impact on health (Le & Le 2010).

Monitoring and evaluation on all levels should be strengthened for the purpose of supporting nutrition intervention in Vietnam to control malnutrition in children, adolescents and adults (Le & Le 2010).

2.5 The Vietnamese food guide pyramid

Figure 11: The Vietnamese food guide pyramid (National Institute of Nutrition n.d.)

This three-dimensional food guide pyramid is directed to the general population of Vietnam. The food pyramid contains messages with the recommended amount of monthly consumption for each food group for an adult. It is divided into seven layers according to recommended levels of consumption. Cereals and tubers are at the bottom of the pyramid, followed by vegetables, fruits, protein-rich foods, fats and oils. Sugar and salt are at the top of the pyramid. The Vietnamese have also guidelines/tips for healthy nutrition in addition to their food guide pyramid (National Institute of Nutrition n.d.).

10 tips for healthy nutrition (here in English):

- Eat a range of meals that include all four food groups: carbohydrates, protein, fats, and vitamins and minerals.
- Eat protein-rich foods from a good balance of vegetable and animal sources. Increase the intake of shrimp, crab, fish and beans/peas.
- Eat appropriate amounts of vegetable and animal fats/oils with a good combination between them. Sesame and peanut oils are recommended.
- Do not use too much salt. Iodized salt is recommended.
- Eat vegetables and fruits every day.
- Ensure food safety rules during selection, processing and preservation of foods.
- Drink an adequate amount of boiled water every day.
- Initiate breastfeeding right after birth, exclusively breastfeed during the first 6 months, then start proper complementary feeding and continue breastfeeding until 24 months.
- Children over 6 months of age and adults are recommended to consume milk and dairy products appropriate to their age.
- Increase physical activity, maintain an appropriate weight, abstain from smoking and limit your consumption of alcoholic/soft drinks and sweets (National Institute of Nutrition n.d.).

2.5.1 Differences towards the Austrian food guide pyramid

The Austrian food guide pyramid has also seven layers. In addition, it is also separated into portions which represent the daily recommended portions of consumption of each food group. The Austrian food pyramid is also applicable for kids.

At the bottom of the Austrian pyramid are non-alcoholic beverages such as water and tea. The Vietnamese do not include beverages in their pyramid, only the guidelines say you should drink enough water every day, but not how much. The layer at the bottom of the Vietnamese pyramid are cereals and tubers. The Austrian have cereals at the third layer from the bottom. Another difference is that the Austrian combined fruits and vegetables in one layer between beverage and cereals. In the Vietnamese pyramid the

vegetables are followed after the cereals, and after the vegetables come the fruits. The next layer of the Vietnamese pyramid is fish, seafood, tofu and meat. The amount of consumption also should be in this order with the first one the most. The Vietnamese have seafood and tofu in their protein-rich food layer which the Austrian one does not have. Instead the Austrian pyramid includes also eggs in their meat and fish layer. The Austrian food guide pyramid have an additional layer with milk and milk products which also contain the olive oil. The milk layer comes before the meat layer. The Vietnamese food pyramid does not have recommendations for milk consummation. This is maybe one reason why the milk consumption in general is really low in Vietnam. The next layer of the Vietnamese pyramid which follows the fish and meat layer are the fats and oils. In the same order is the Austrian one. On top of the Austrian food pyramid are fatty and salty foods, sweets as well as soft drinks. The Vietnamese pyramid has sugar and salt separately.

Figure 12: The Austrian food guide pyramid (Bundesministerium für Gesundheit n.d.)

The separation into portions of each layer of the Austrian food guide pyramid makes it easier for people to understand and follow the recommendation of consumption. The Vietnamese food pyramid has messages besides the recommended amount of monthly consumption for each food group. These recommended amounts for one month make it hard for people to follow the recommendation as it is hard to remember the exact amount of food and/or an ingredient consumed during a day or even for a whole month. The recommendation should be on a daily basis to make it easier to adapt. Also there should not be exact amounts given as recommendations.

The Vietnamese food guide pyramid is only intended for adults. It is not applicable for children. In Austria, a food guide pyramid specific for pregnant and lactating women has been developed. It is the same food pyramid only with extra portions adapting to the needs of pregnant and lactating women.

Vietnam should improve their food guide pyramid and their guidelines for better understanding and easier following of the recommendation. This is very important to prevent malnutrition in the Vietnamese population which is still a major national problem.

3 Migration and Nutrition

This chapter gives an overview of the migration in Austria and describes the process of dietary acculturation among immigrants.

3.1 Migration in Austria

Since the 1960s, the demographic development of Austria was influenced by immigration. First, the immigration was characterized through the recruitment of working immigrants, the so-called guest workers. In the beginning of the 1990s, also many war refugees came from the former Yugoslavia to Austria. But by 1992-1993, the number of immigrations was reduced because of the new quota system. With the migration from the enlarged EU region and the family reunification the immigration increased again from 2001 onwards (Anzenberger et al. 2015).

3.1.1 The definition of migration

There is no standardized, official definition of migration in Austria and the European Union. The term "migration" describes the process of people migrating across borders, to live and work there, permanently or temporarily. Migration is a highly dynamic process (Bundeskanzleramt Österreich n.d.).

3.1.2 People with migration background

The population with a migration background refers to all persons whose parents were born abroad, regardless of their nationality. In 2014, there were about 1.715 million people with an immigrant background living in Austria that was about 20.4% of the total Austrian population. The persons with a migration background are divided into two groups. There were about 1.254 million immigrants of the first generation who were born abroad themselves and moved to Austria. About 460,000 subjects were from the second generation who are born in Austria and whose parents were born abroad.

Around 59% of the population with an immigrant background are foreign nationals, while 41% own an Austrian citizenship. Among the immigrants of the first generation only one-third (32%) was nationalized, while two-thirds (66%) of the members of the second generation are Austrian national citizens (Bundeskanzleramt Österreich n.d.; Baldaszti et al. 2015).

3.1.3 Current numbers of immigrants in Austria

In the beginning of 2015, there were around 1.146 million foreign residents in Austria. The foreigners made up to 13.3% of the total population. The increase of more than 80,000 foreign national citizens compared to the beginning of 2014 is the result of a positive migration balance of the foreign population (Baldaszti et al. 2015).

Among foreign nationals in Austria, the Germans are still by far the largest group. On January the 1rst of 2015, more than 170,000 Germans were living in Austria, followed by 115,000 Turkish and 114,000 Serbian citizens. On the fourth and fifth place Bosnia and Herzegovina (93,000) and Romania (73,000) were ranked. On the ranks six to ten, there were the nationals of Croatia, Hungary, Poland, Slovakia and Russia. From outside Europe there were about 17,000 Afghan nationals accounted for the largest nationality followed by respectively 11,000 Chinese and Syrian citizens (Baldaszti et al. 2015).

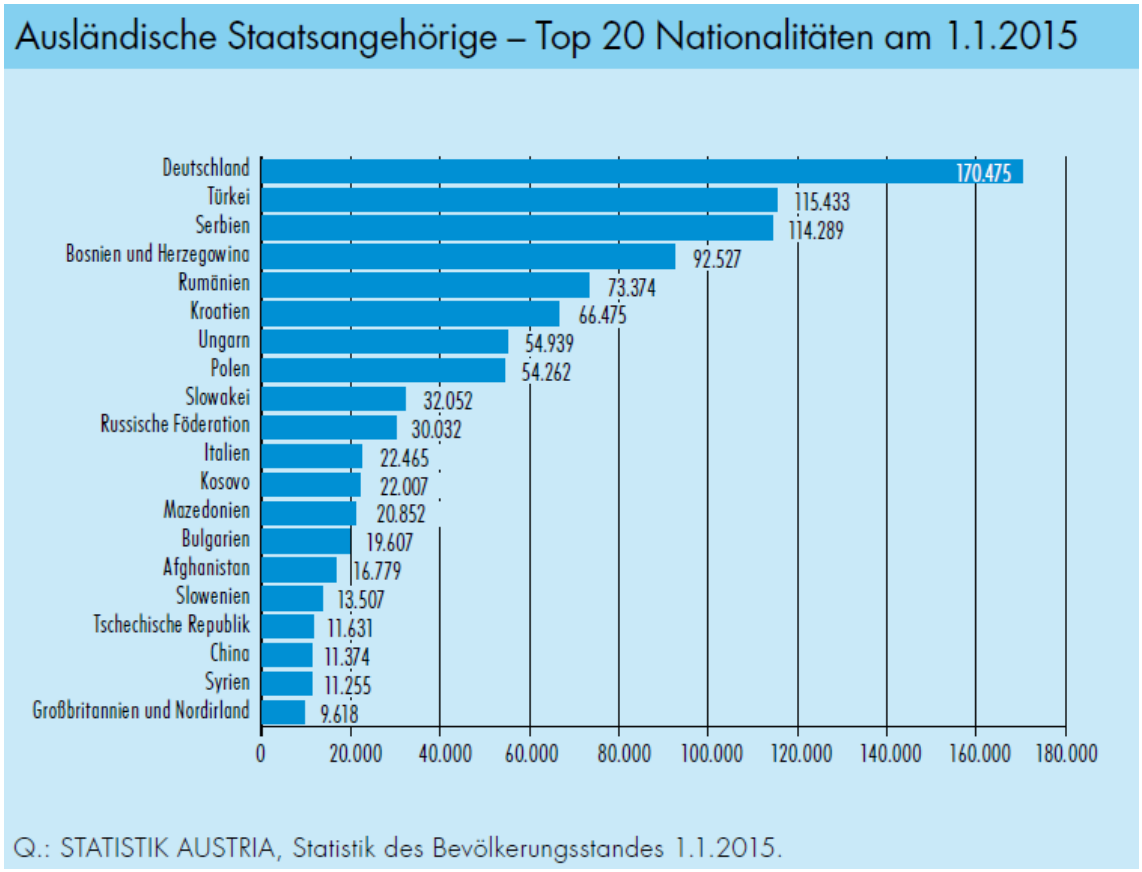


Figure 13: Population statistics 1.1.2015 (Baldaszti et al. 2015)

There was also a clear increase of asylum aspirants in Austria. In 2011, the number of asylum applications was around 14,400. In 2012 and 2013, the number rose to 17,500 and in 2014, it was 28,100. Even more significant was the number of persons who received political asylum, from about 4,100 people in 2013 to 11,600 in the year 2014. The most asylum aspirants came from Syria (7,730) and Afghanistan (5,076). Compared to other EU nations, Austria was ranked seventh in 2014 by the absolute number of asylum applications. In relation to the population, however, Austria was on the third place (after Sweden and Hungary) (Baldaszti et al. 2015).

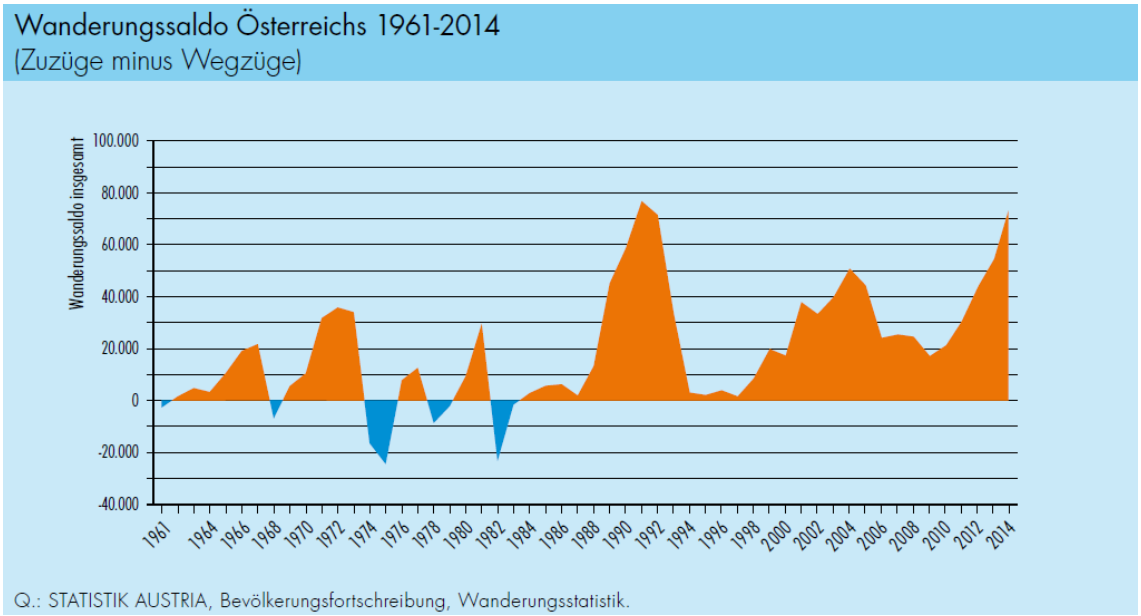


Figure 14: Migration statistics (Baldaszti et al. 2015)

3.2 Health condition of immigrants in Austria

3.2.1 Subjective health condition

Immigrants from the former Yugoslavia (excluding Slovenia) and Turkey estimated their health condition as rather poor. Only 67% of men and 62% of women reported to feel good or very good on health. A poor or very poor health was indicated by 13% of men and 14% of women. Men and women from Austria and the EU countries rated their health better.

In the HBSC study (Health Behaviour in School-aged Children) pupils in the ages 11, 13, 15 and 17 years were asked about their health condition. The result showed that children and teenagers with an immigrant background estimated their health more

negatively than children and teenagers without an immigrant background. However, the level of wealth of the family played here a major role (Anzenberger et al. 2015).

3.2.2 Overweight and obesity

Immigrants, standardized for age, were more likely to be obese than people without an immigrant background. For women these differences were provided more precisely: Immigrant women (23%) were twice as likely obese than women without a migration background (11%) in Austria. For men these differences were rather small: 17% of the migrants were obese and 11% of the men without an immigrant background. The risk of obesity was for migrant women and men statistically significant higher than for those without an immigrant background. In Austria, immigrant men had a 1.8-fold higher risk and immigrant women a 2.5 times higher risk of being obese (Anzenberger et al. 2015). High attention should be also be paid to kindergarten and school. Here, the correlation of migration and overweight was quite clear. In a project by SIPCAN (Special Institute for Preventive Cardiology And Nutrition), in which also experts from the Medical University of Vienna participated, a study with 617 Viennese students was conducted. They found that 70% of the overweight children have a migration background. In addition, the study found out that 19% of the children with an immigrant background consumed fast food several times a week. At the same time, the result showed that more children with an immigrant background were daily eating fruit and vegetables, namely 31% compared to 14% of the local kids. This showed that prevention measures may already be effective in this age group (SIPCAN „Initiative für ein gesundes Leben“ n.d.).

3.2.3 Physical activity

Regarding physical activity there were also differences according to migration background and gender. Approximately one third of men with no migration background (32%) were physically active in Austria. For men with an immigrant background the percentage was about 28%. Women were more rarely physically active. Almost a quarter (24%) of women without an immigrant background and only 15% with were active in a physical way. In the age group of 15 to 34 years old men there were no differences in physical activity according to migration background (40% physically active). Women with

a migration background were less active than women without an immigrant background in all age groups in Austria (Anzenberger et al. 2015).

3.3 Changes in food habits among immigrants

The number of immigrations all over the world is steadily increasing. There are immigrations to developed countries and there are rural-urban migrations within developing countries. For the person that immigrates this can be a major change in his or her lifestyle and environment, which also can result in increased risk of chronic diseases (Satia 2003). For example, a study from Ziegler and colleagues (Ziegler et al. 1993) showed that Asian-American immigrant women who had migrated to the West over a decade or longer ago had an 80% higher risk of breast cancer than migrants who just moved recently. There are many migrant studies revealing that the change toward a "Westernized" lifestyle results in a higher risk of different major chronic diseases. The most concerned shift is the adoption to a "Western" diet which is a serious risk factor for chronic diseases among immigrants. The process by which the immigrants adopt new dietary patterns is known as *dietary acculturation* (Glade 1999; National Research Council (US) Committee on Diet and Health 1989).

3.3.1 Definition of acculturation

Acculturation is the process by which a group, usually a minority, adopts the cultural pattern of its host country. This can be adaptations in belief, religion and language for instance. The process of acculturation can occur on micro and macro levels. On the micro or individual level which is known as the "psychological acculturation", changes in attitudes, beliefs, behaviors and values in individuals occur. The macro or social/group level refers to physical, biological, political, economic and cultural changes in the acculturation group as a whole. There are many different factors which play a role if an individual or a group makes adaptations to a new society. Clear is that the more different the immigrant's original and host cultures are the more difficult the acculturation will be (Satia 2003).

3.3.2 Definition of dietary acculturation

Dietary acculturation is the process by which members of a migrating group adopt the food choices and eating habits of their new environment. For instance, when a Korean immigrant in the US eats more “Western” foods such as hamburgers, French fries and potato chips than traditional Korean dishes like Kimchi, Galbi gui and Doenjang jigae. One characteristic of dietary acculturation is the reciprocal way of adaptions. Which means not only the immigrants make new changes in their diet but also the host group may adopt some of the migrant’s food and dietary practices to their own. This can be noted in the rising number of ethnic supermarket and restaurants all over the developed countries (Satia 2003).

Dietary acculturation is a multidimensional, dynamic and complex process. Studies showed that immigrants may keep some traditional foods and exclude others. They may find new ways of preparing traditional dishes with foods available in the host country. Some studies also indicated that at dinner time immigrants were more likely to eat traditional meals, maybe because they consume the dinner with other family members. Breakfast and lunch on the other hand are more likely to be “Westernized”. So, acculturation can be adopted only partly or fully to the host environment. It is also important to know that dietary acculturation can have both positive and negative dietary changes which leads to positive and negative health consequences. For example, the decreased consumption of seafood and increased intake of red meat are unhealthy changes for an Asian immigrant, while eating a larger variety of fruit and vegetable is a healthy change resulting from dietary acculturation (Satia et al. 2001; Otero-Sabogal et al. 1995; Satia et al. 2000; Lee et al. 1999; PAN et al. 1999; Raj et al. 1999; Bermúdez et al. 2000).

There are many factors influencing the dietary acculturation which can result in many different patterns and habits of food intake (Satia 2003).

3.3.3 The model of dietary acculturation

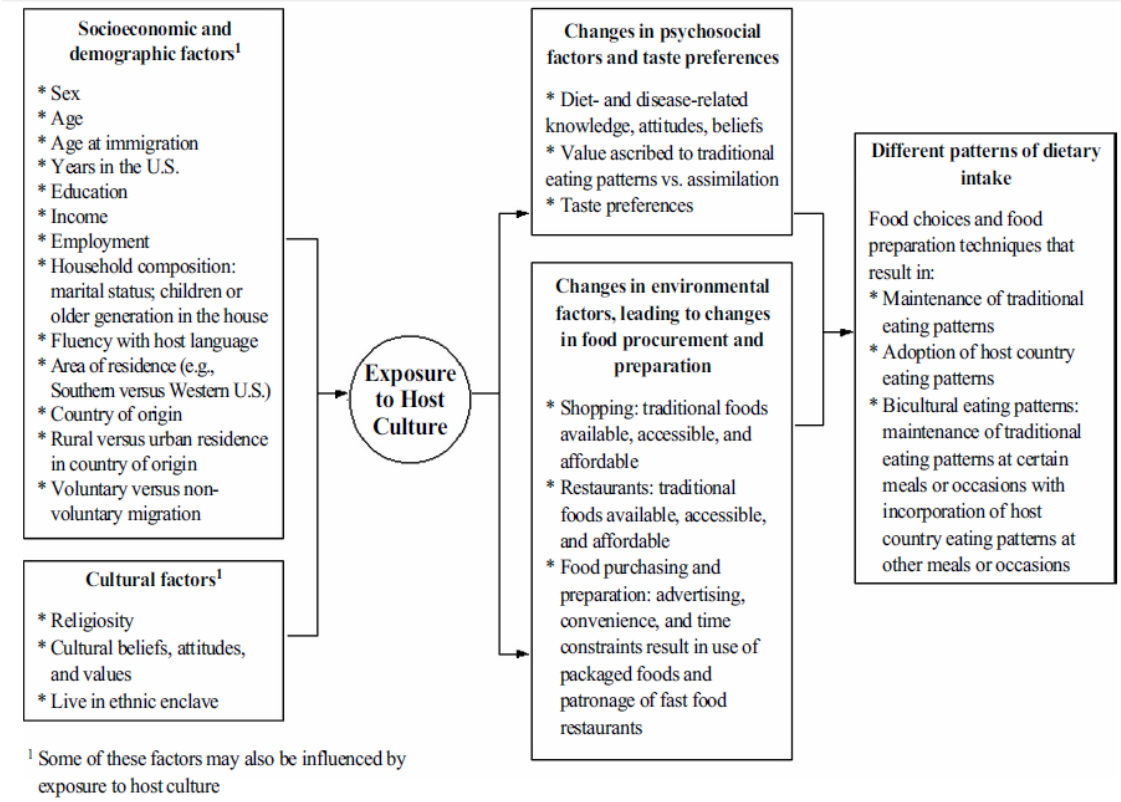


Figure 15: Proposed model of dietary acculturation: The process by which racial/ethnic immigrant or rural-urban migrant groups adopt the dietary patterns of their new environment (Satia 2003)

As seen in Figure 15, there are socioeconomic, demographic and cultural factors which can influence the exposure to the host culture. As a result of this set of characteristics the extent to which new immigrants may make changes in psychological factors and taste preferences is predictable. Also, changes in environmental factors leading to changes in food procurement and preparation are notable. At the end, these factors can lead to different patterns of dietary intake (Satia 2003).

It has been identified that the factors longer residence in the host country, high education and income of the immigrant, and employment outside the home result in a higher exposure to the host culture. Also the factors being married, having young children and fluency with the host language play a major role for exposure and consequently acculturation. This, however, does not mean that when one can read and speak the host language fluently he or she will completely adopt the food habits of the host country. The generation level may be also a good index of dietary acculturation. As

research has indicated, higher generations (third or fourth) of immigrants were more likely to adopt the eating patterns of the host country compared to the first generation immigrants (Satia 2003).

Changes in beliefs and knowledge of diet and diseases can be a result of the exposure to the host culture trough television, radio, books, advertisements, etc. For example, the exposure to nutrition and health messages in the host country can lead to changes in the beliefs of diet and chronic diseases (Satia 2003).

The exposure to a new food supply can induce an immigrant to change his or her food procurement and preparation. The unavailability of traditional foods and ingredients such as certain types of vegetables or spices makes it harder for immigrants to prepare traditional meals and they will as a result consume more foods of the host county. Also, the traditional foods are often very expensive in the host country and are therefore not affordable for everyone. The time-consuming preparation of traditional dishes is also an issue why immigrants may prefer more convenient prepackaged foods or to go to abundant fast food restaurants. These environmental or “daily life” factors are one of the most common reasons for dietary acculturation among immigrants (Satia 2003).

There are three different ways of the impact of dietary acculturation on an immigrant. First, the immigrant maintains his or her traditional food habits. Second, the immigrant fully adopts the host environment foods and eating patterns. Or third, there will be an incorporation of the host foods and eating habits into their own diet while also maintaining some traditional dietary practices. The third way of dietary acculturation is also called biculturalism (Satia 2003).

There is another model of changes in food habits from Koctuerk which was used in many studies for the process of dietary acculturation.

In this model, the food is separated in three main groups with different degrees of importance according to their role in a dish and/or meal. Here, staple foods play the central role with the complements on second and accessory foods on third place (Koctuerk 1995).

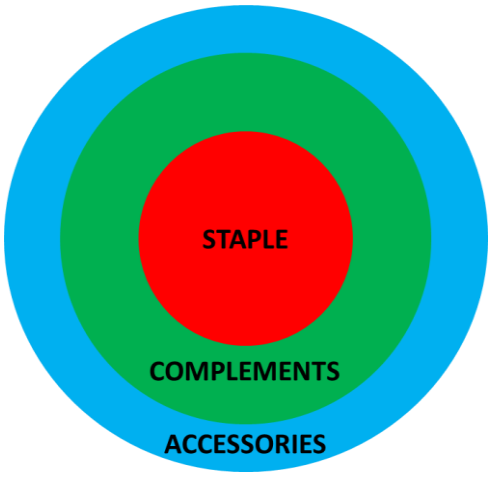


Figure 16: The structure of food habits (Koctuerk 1995)

The staple food(s): A staple food is a food rich in carbohydrates with mild/neutral taste which is inexpensive and available in an environment. It is the principal component of a meal. Staple foods are only a few food items, such as bread, rice or potatoes. The staple food is the most important element in a dish due to its possibility to identify individuals according to their staple foods. For example, Asians are rice-eaters and North European typically eat boiled potatoes. So, a staple cannot be substituted easily by another item because this would change the food tradition of a dish (Koctuerk 1995).

The complementary foods: Complements to staple foods are one or several items from four food groups which are meat/fish/eggs, milk/cheese, vegetables and legumes. The staple foods combined with the complements form the basic foods. While a staple food should not be substituted, complementary foods can be exchanged with other items without ruining the whole food culture (Koctuerk 1995).

The accessory foods: Accessories are food groups including items such as fats, herbs and spices, sweets, nuts, fruits and drinks. Their role is to enhance the taste of a meal and make it more presentable like the function of accessories that add a final touch. Accessory foods are the least important for the survival of a food tradition, they are less tied to cultural identity which is why accessories can be substituted according to taste (Koctuerk 1995).

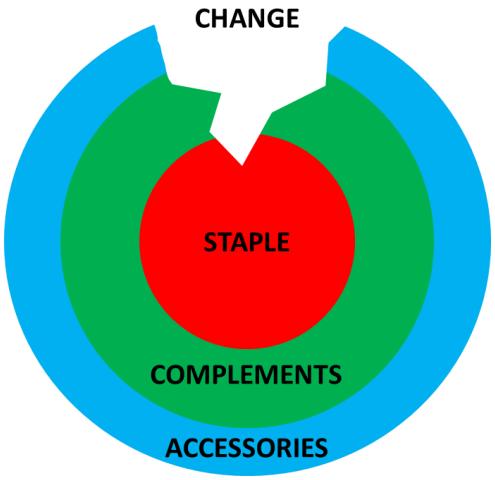


Figure 17: Change in food habits (Koctuerk 1995)

The staple food in the traditional Vietnamese diet is rice which is often combined with this complements: quick-fried meat or fish and vegetables. These food items form the main dish of a Vietnamese meal. Accessory foods to the main dish are specific sauces and clear soups or tea as drinks. The most consumed fruits in Vietnam are of tropical origin. The consumption of desserts and sweets is quite low and the sources of fat for cooking are usually soy bean oil and pork lard. So, after Vietnamese moved to the UK the first dietary change that could be noted is the increased intake of "Western" drinks such as coffee, carbonated drinks and beer. Also the consumption of cakes, muffins, potato chips and other snacks was quite high and the use of pork lard decreased in favor of butter. However, the staple food rice has maintained a central role in the Vietnamese diet in combination with quick-fried meat or fish and vegetables (Carlson et al. 1982).

As seen in the example with the Vietnamese immigrants in the UK, changes in food habits start with the accessory foods. This is because of their role as "taste-givers" in meals and also because they can be exchanged without ruining a whole food tradition. Since this group of food includes fats, sweets and drinks, such changes can have large impacts on health (Koctuerk 1995).

So, usually changes of food habits begin from the outer shell towards the core. In case of the diet, the change begins with incorporation of new accessories then continues with different complementary foods and finally ends with the exchange of new staples. The closer the change is coming towards the center, the slower is the process of change. The

reason for the slower change is that the attachment of traditional staple foods is the strongest. Italians who migrated to the USA still regularly eat their traditional staple foods which is pasta and bread. Thus, a staple is the last food item that changes in a diet if it changes at all. On the other hand, when a person starts to consume the staples of another culture routinely, it can be assumed that he or she has totally changed his or her dietary habits (Koctuerk 1995).

As mentioned before, changes in eating patterns are also possible. The meal having the most culture-loaded value changes last, while those which are culturally neutral change first. The first noted change in eating patterns of immigrants is the increased "snacking" between meals. Breakfast seems to be the least culture-loaded meal among immigrant followed by lunch where often the contact with the new society and its culinary norms takes place. The dinner is the preferred meal for traditional foods and dishes which is commonly consumed with other family members. This meal has the most value for traditional culture and is therefore strengthening the sense of belonging and security (Koctuerk 1995).

3.3.4 Dietary acculturation among immigrants with a focus on immigrant women

According to The Organization for Economic Cooperation and Development (OECD) there are six main countries receiving 77% of overall immigrant populations which are the United States, Canada, Australia, United Kingdom, Germany and France. The total number of international migrants has more than doubled over the last decades. In 1975 there were 20 million international migrants and by the year 2000 there were over 44 million immigrants. With a gradually increase of this number there will be about 405 million migrants by 2050 (Popovic-Lipovac & Strasser 2013).

One of the main factor for migration are economic reasons which lead people from low human development to high human development countries. Three key areas of movement are noted: to Europe from Asia, to North America from Asia, and to North America from Latin America (Popovic-Lipovac & Strasser 2013).

Food habits are often the last that will adapt to the new culture and environment. Maybe because eating habits play an important symbolic, religious and social role in the lives of people all over the world (Popovic-Lipovac & Strasser 2013).

As said before, dietary acculturation in Western countries is associated with negative choices in the dietary pattern like high consumption of fat and sugar, low consumption of fruits and vegetables in the diet, lower physical activity, higher Body Mass Index and bigger portion sizes for examples. As a result of such changes in food habits the risk of chronic diseases including obesity, hypertension, cardiovascular diseases, type 2 diabetes mellitus, metabolic syndrome, mental diseases and even cancer are increasingly high among immigrants (Popovic-Lipovac & Strasser 2013).

At this point, it is important to know that not all people from the same ethnic group react similarly to dietary acculturation. So for example, Asians and Hispanic consist of very different subgroups. That means factors that are influencing dietary acculturation in one subgroup (e.g. Chinese Americans) may not have the same effects for another subgroup (e.g. Korean Americans) (Satia 2003).

High attention concerning this topic should be given to immigrant women who are negatively influenced by migration and dietary acculturation due to their double burden being female and also being a migrant (Popovic-Lipovac & Strasser 2013).
There are many studies revealing that female migrants have adopted several unhealthy food habits to their traditional diet such as high consumption of fat and sugar snacks and drinks, as well as fast foods. The women also reported that they were gaining weight much faster than when they were living in their home country. The main reasons of this negative acculturation are different barriers which are resulting from the new environment. So, one barrier is the high price of healthy food. When unhealthy products are much cheaper and maybe also taste better then unhealthy foods which are high in fat and sugar are more likely purchased (Koctuerk 2004). Another reason is that immigrants from low-income countries may have an easier access to highly processed foods in the host country and paired with a low nutritional knowledge this may lead to negative implications for health (Holmboe-Ottesen & Wandel 2012). Also the availability of traditional foods and ingredients is a huge barrier to cook traditional dishes. The children's preferences as well play a major role in the choices a mothers is making. Another barrier is the uncertainty towards new foods maybe caused by language barriers. Additionally, convenient and affordable fast food restaurants and prepackaged

dinners make it harder for female migrants not to adopt these unhealthy food habits (Satia 2003; Koctuerk 2004; Mellin-Olsen & Wandel 2005; Bayanzadeh 2008).

Female migrants need specific attention due to their reproductive role which creates unique nutrition needs and due to their role in buying and preparing the family meals. Thus, women have a strong impact on the dietary practices and health behavior of the whole family (Popovic-Lipovac & Strasser 2013).

3.3.5 Health status of immigrants with a focus an female migrants

The term "healthy migrant effect" is mentioned in several studies. It describes the phenomenon when immigrants upon arrival in the new host country have a better health profile than the native population. Many studies also showed that female immigrants were healthier when they arrived and lost their health advantage at a faster rate than compared to male migrants. There is also a positive correlation between the mortality rate and the duration of stay in a foreign country. That means the longer an immigrant is remaining in a host country, the worse is his or her health condition. This is the result from changes in the health behavior among immigrants like dietary practices and lifestyle (Popovic-Lipovac & Strasser 2013; Himmelgreen et al. 2004; Read & Reynolds 2012).

So, studies revealed that the prevalence of overweight and obesity increases with the duration of residence in the United States among immigrant women. This is associated with a higher risk of cardiovascular diseases, hypertension and type 2 diabetes mellitus. The biggest increase of overweight and obesity can be seen in those migrants who moved at younger age to the host country. Altogether, the studies have indicated that the longer immigrants live in the USA or Canada, the worse their health condition becomes. On the other hand, immigrants from Europe may even have positive impacts on their health by living in this foreign environment (Roshania et al. 2008; Lahmann et al. 2000).

Several studies analyzed the strong relationship between social economic status indicators and health condition among immigrants living in Europe, USA and other countries. There are many different reasons for this trend: high market prices for healthy foods, insecurity about new products, lack of information about food, different attitudes

towards health, stress, physical inactivity, marketing of cheaper, energy dense, micronutrient-poor foods and beverages, etc. Especially for women this trend is really dangerous with their double discrimination for being a woman and being poor and as well their female reproductive role. Furthermore, low social economic status indicators of a pregnant woman can not only affect their own health condition and overweight/obesity risk but also those of the next generations (De Irala-Estevez et al. 2000).

It has been noted that there is a so-called "Hispanic paradox". This paradox indicates that certain immigrant groups, for example Latinos living in the USA, show a better health status than the native population despite their low social economic status indicators (Lerman-Garber et al. 2004).

Immigration and the resulting lifestyle changes have a great effect on the eating practices of all groups of migrants and especially women. The main reason for this changes is associated to the Western lifestyle connected with purchasing and preparing meals. In USA and Canada this trend has become a major concern (Popovic-Lipovac & Strasser 2013).

3.3.5.1 United States and Canada

In the US and Canada the food habits of the population are often connected with high consumption of saturated fat and cholesterol which can lead to atherosclerotic diseases and an increased risk of breast, colon and prostate cancers. There, wrong dietary practices and other nutritional factors have been associated with 6 of 10 leading causes of death, which are: hypertension, cancer, coronary disease, cardiovascular disease, chronic liver disease, and type 2 diabetes mellitus. Furthermore, the prevalence of overweight and obesity has been on the rise among all immigrant groups especially African American and the Hispanic people (Popovic-Lipovac & Strasser 2013).

Hispanics have changed a lot of their eating patterns as a result of dietary acculturation in the USA and Canada. The changes are for example the decreasing intake of many traditional dishes rich in vegetables, the substitution of corn tortillas with wheat flour tortillas which result in a higher intake of fat, the substitution of lard with butter, oil, salad dressing, mayonnaise and sour cream, and a higher intake of white bread,

sweetened beverages, ready-to-eat cereals and fast food meals (Popovic-Lipovac & Strasser 2013).

Similarly, the food habits of the Asian immigrants in the US and Canada have changed. There is a great difference between a traditional Asian diet including high consumption of rice, vegetables, and noodles and the North American diet mainly consisting of animal proteins, fats and sugar. Due to the changes of dietary acculturation, the mortality rate of heart diseases and as well the prevalence of type 2 diabetes, hypertension and breast cancer has been increasingly high among Asian immigrants in the USA as well as Canada (Popovic-Lipovac & Strasser 2013).

3.3.5.2 Europe

In Europe the situation is similar but with less dangerous and severe impacts on the migrants. A recent study from Huijts (Huijts & Kraaykamp 2012) analyzed the health of immigrants in 31 European countries. The results from this study were less explicit. The impact that dietary acculturation has on the health of immigrants varied from no effect at all to significant negative effects.

On the other hand, there are many studies which indicated that migrants living in Germany are a high risk population group. The results showed higher prevalence of high blood cholesterol levels and overweight, as well as preventive services being used decreasingly among European immigrants (Ronellenfitsch & Razum 2004). A relatively high risk of cardiovascular diseases have female immigrants from the former Soviet Union in comparison with the European residents (Haas et al. 2010). In England the risk of being overweight and obese among Indian and Bangladeshi immigrant women is increasing. Also the prevalence of type 2 diabetes mellitus is 2-3 times higher in migrants from India and Bangladesh than in the general population. South Asians in particular are strongly associated with the risk of obesity especially central obesity, type 2 diabetes mellitus, and cardiovascular diseases. This can be explained by genetic, epigenetic, and lifestyle factors and also gene-environment interactions which predispose people from South Asia for these diseases (Holmboe-Ottesen & Wandel 2012). In Sweden the prevalence of chronic diseases is also higher among immigrants compared to the locals. There, the trend of overweight and obesity is as well on the rise especially among female

migrants from Chile, Finland, Hungary, Southern Europe, the former Yugoslavia, and the Middle East (Gadd et al. 2003). Immigrant women from Iran and Turkey are at high risk for developing diabetes and cardiovascular diseases (Wiking et al. 2004). However, there are other studies which have revealed that migrants living in Germany have lower overall mortality rates than the local German people (Winkler et al. 2009).

In summary one can say that it is not quite possible to generalize the immigrant population in a country. There are many different factors influencing the migrants when coming to the host country which have to be taken into consideration (Popovic-Lipovac & Strasser 2013).

3.3.6 Health status of children with parental migration background (Second generation)

A study conducted in Sweden discovered the association between childhood overweight and obesity and immigration. The probability of being overweight, having low physical activity and having the lowest level of parental education were much higher among children of immigrant parents especially those of both parents being immigrants (Besharat Pour et al. 2014).

So, children of one immigrant parent were 30% more likely to become overweight than children of Swedish parents. The same likelihood could be found for low physical activity. The children whose both parents were immigrants had a 66% higher risk of being overweight compared to children of Swedish parents. The odds of having low physical activity were 70% higher among children of both immigrant parents. The result also showed that girls with both immigrants parents were the most likely to be overweight. They had a two-fold higher risk than offspring of Swedish parents. It could also be observed that the lower the level of parental education was the higher was the risk of having low physical activity amongst their offspring regardless of parental migration status. But on the contrary, children of immigrant parents had healthier dietary patterns in comparison with Swedish children including higher intake of fruits and vegetables (Besharat Pour et al. 2014).

3.3.7 Conclusions and future prospects

Due to the many results from different studies with the same negative outcomes of dietary acculturation amongst immigrants around the world, there is an urgent need for

action for these migrants especially immigrant women and children with parental migration background to prevent nutrition-related chronic diseases. Therefore public health programs are urgently needed to teach immigrant women on preparing and cooking canned and frozen foods and other products that are unfamiliar. How to read nutrition labels and to decrease the intake of fat and sugar-modified products should be important key points of these programs. So, the adjustment to a changed food supply can be enabled without losing a whole traditional culture. In addition, physical activity should be promoted to prevent associated diseases like overweight and obesity (Popovic-Lipovac & Strasser 2013; Besharat Pour et al. 2014).

The analysis of the food culture in different immigrant groups is a main target to achieve appropriate prevention of nutrition-related diseases among immigrants all over the world. It should be also taken into consideration that socio-economic factors have a greater impact on immigrants due to the fact that migrants are often poorer which is particular important for female migrants because they are in general poorer than men. These interventions can only be effective when dietitians and physicians are sensitive to women's cultural origin, values, behaviors and feelings (Popovic-Lipovac & Strasser 2013; Besharat Pour et al. 2014).

4 Materials and methods

The study which has been conducted is described in detail in the following chapter.

4.1 Sample group

Criteria of selection: Vietnamese (fully or partly), living in Austria (long or short residence), older than 18 years

- Sample size: 42 subjects, male: 17, female: 25

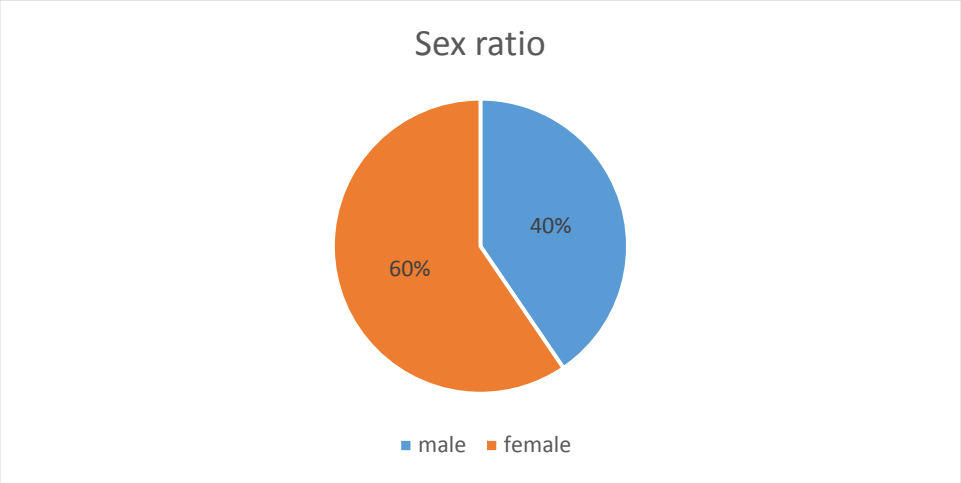


Figure 18: Sex ratio of the sample group

- Age distribution:

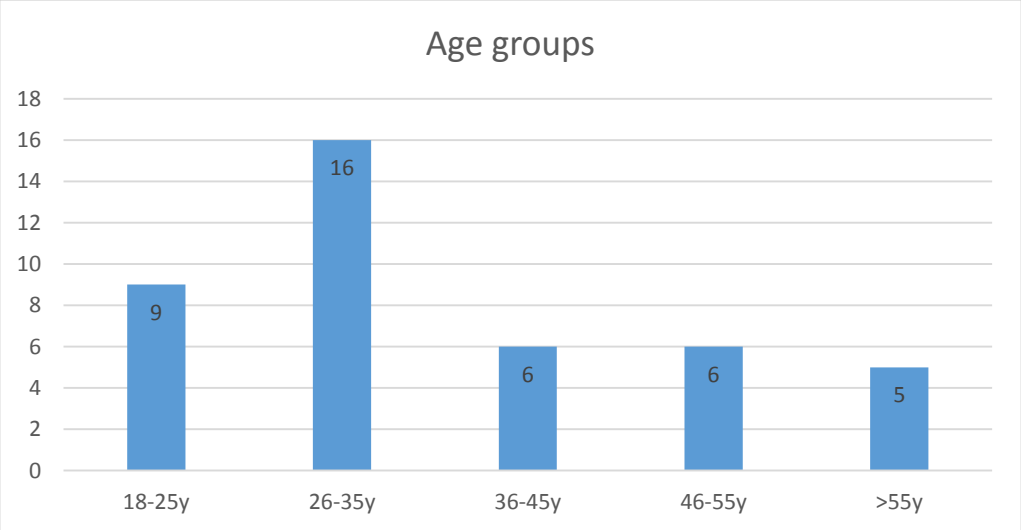


Figure 19: Age groups in the sample group

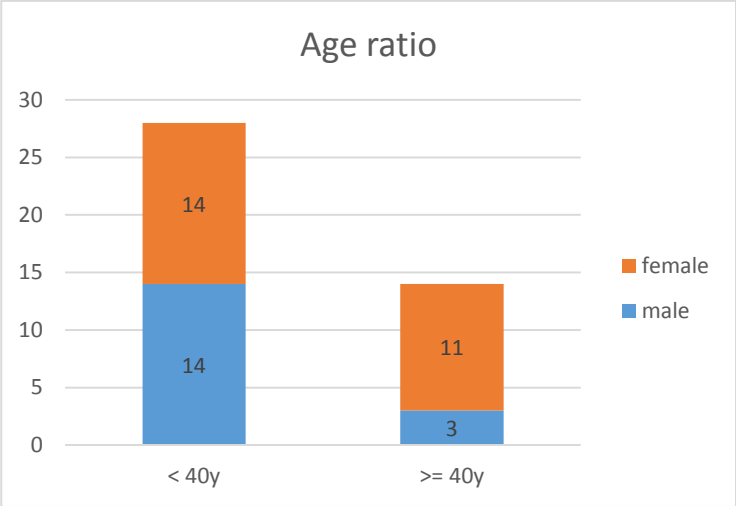


Figure 20: Age ratio of the sample group

- Subjects with both Vietnamese parents: 39, subjects with one Vietnamese parent: 3

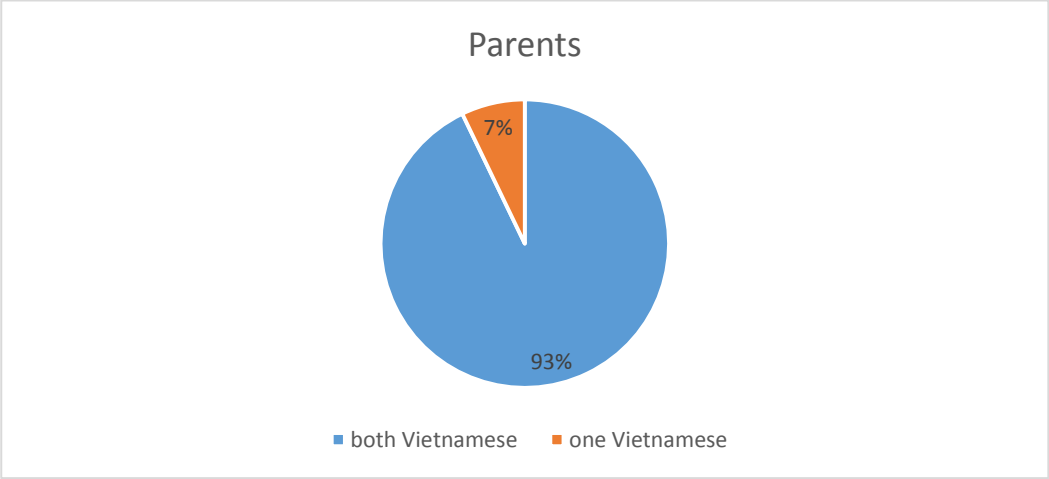


Figure 21: Vietnamese background of the parents in the sample group

- Weight classification for adults on the basis of BMI (according to WHO 2008):

  Underweight: BMI < 18.5 kg/m²

  Normal weight: BMI 18.5 - < 25 kg/m²

  Overweight: BMI 25 - < 30 kg/m²

  Obesity: BMI >= 30 kg/m²

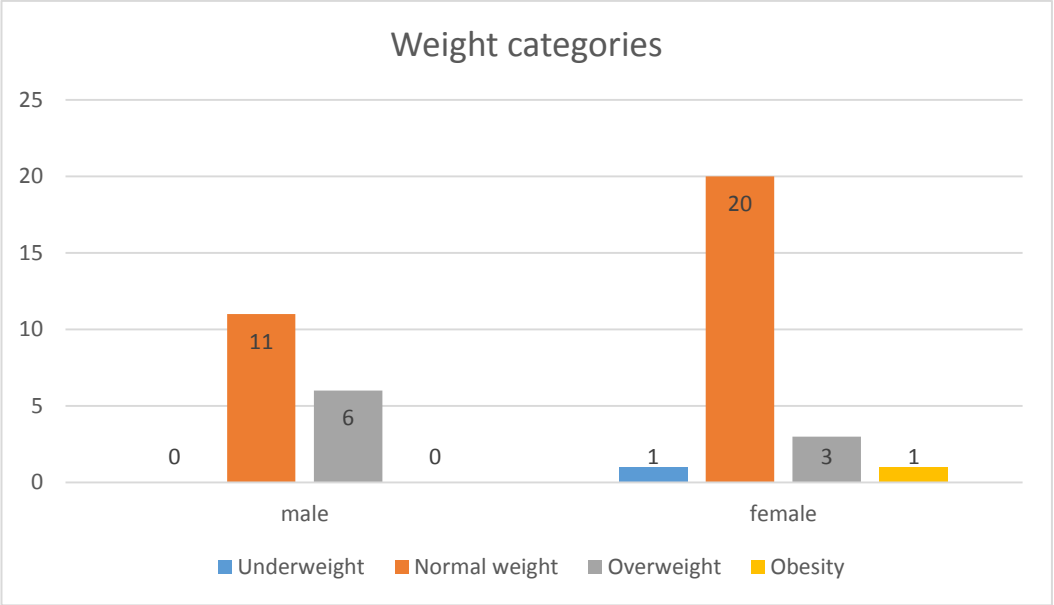


Figure 22: Weight categories of the sample group

*Results on self-reported data

4.2 Instrument for data collection

GloboDiet: 24-Hour Diet Recall Interview

A 24h-recall interview is a method of collecting data to capture the foods that have been consumed from the subject a day before the interview. The interview can be carried out face to face or by telephone.

The data collected by a 24h-recall are much more detailed than from a closed questionnaire such as *Food Frequency Questionnaire* or *Diet History Questionnaire*. GloboDiet is an interview-based instrument of collecting data which enables detailed description and quantification of the foods, dishes and dietary supplements that have been consumed the day before the interview. With the software, a standardization of data within and between the countries can be made. There are frequent control questions and a chronological order of the information collecting method supporting the memory of the subject. For the quantification of the consumed foods a photo book with images of foods and dishes in different portion sizes was used. The software ensures an automatic codification of the foods and recipe ingredients as well as an

estimated calculation of the nutrient uptake.

GloboDiet is currently one of the few nutrition instrument of collecting data which provides comparable nutrition data on a European base.

The general structure of GloboDiet:

The GloboDiet 24h-recall is divided into five main steps:

1. General information about the interviewer, the subject, the day of the interview and also the wake up-time
2. The quick list
3. Description and quantification of the foods and recipes
4. Control of plausibility on nutrient level
5. Intake of dietary supplements

The quick list is a list where all foods and recipes which have been consumed by the subject on the day of the interview can be registered. In doing so, the chronological order of the meals should be considered. For each predetermined meal the consumed foods of the subjects are noted by general definition without further description or quantification. An extra field allows the entry of the dietary supplements.

4.2.1 The work with GloboDiet

The program GloboDiet is very precise and a course of instruction was needed. The first interviews with GloboDiet took really long, about an hour and a half. The user manual for GloboDiet says that an interview with a subject should take about 45 minutes. The longer time span can be explained by the design of the program. GloboDiet is been programmed for Austrian people on an Austrian diet. Consequently, the software does not provide many Vietnamese foods and dishes and the author had to create new food terms or search for the recipes in the internet. Also Vietnamese dishes consist of many exotic ingredients, therefore it takes much longer for one interview. But with training the author become more experienced.

Another hurdle was the language barrier of the author. The author did not know every German word for a Vietnamese food or dish. Therefore, research was needed again. In some cases, similar food groups have been chosen for faster results.

Every subject had to be interviewed two times to exclude bias depending on a specific interview day (illness, vacation etc.). Most of the subjects could remember easily what they have eaten the day before the interview. But there were some who did hard on remembering. However, with the right questioning method all interviews could be finished correctly.

4.3 Evaluation of data

Statistical analysis has been made with SPSS Statistics. All relevant nutrients were tested against reference values. For comparison of mean values, t- tests were performed. Boxplots were created for graphic presentation of significant differences. GLM (General Linear Model) was used for correlations and regression calculation.

The α were set at a 0.05 level. That means that results with a probability of error of $p<0.05$ were noted as significant and were marked with a star (*).

4.4 Results and outcomes

The evaluation of the intake data of the main nutrients, vitamins and minerals has been made on the basis of the reference values for nutrient uptake from D-A-CH 2015 (Anon 2015).

4.4.1 Energy and main nutrients for energy delivering

Zusammenfassung von Fällen

Sex (1=male,2=female)		Energie (Kilokalorien) kcal	Eiweiß (Protein) mg	Fett mg	Kohlenhydrate, resorbierbar mg
1	H	17	17	17	17
	Mittelwert	1880,4901	90136,6894	63925,0119	221935,4634
	Median	1575,8063	91951,4802	57893,3376	203282,1235
	Standardabweichung	634,14128	36582,70153	25122,65423	110542,6381
	Minimum	1369,07	41488,23	37902,66	82989,76
	Maximum	3832,03	203288,89	117767,74	564392,09
2	H	25	25	25	25
	Mittelwert	1515,7495	66084,0595	56886,6784	171139,2002
	Median	1478,8684	67371,7729	50658,5091	162531,6931
	Standardabweichung	461,83966	21902,78550	19834,75248	53965,19563
	Minimum	609,55	14166,12	27304,93	60077,61
	Maximum	2670,10	129405,75	103806,01	291664,72
Gesamtsumme	H	42	42	42	42
	Mittelwert	1663,3826	75819,6478	59735,5277	191699,5924
	Median	1536,6349	71986,9349	52933,5765	179287,3541
	Standardabweichung	560,91080	30754,90667	22109,29647	84322,02951
	Minimum	609,55	14166,12	27304,93	60077,61
	Maximum	3832,03	203288,89	117767,74	564392,09

4.4.1.1 Energy

MEN

For men a daily energy requirement of 2300 kcal (PAL 1.4; Age: 25 to under 51 years) was taken into calculation.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Energie (Kilokalorien) kcal	17	1880,4901	634,14128	153,80185

Test bei einer Stichprobe

	Testwert = 2300					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Energie (Kilokalorien) kcal	-2,728	16	,015	-419,50987	-745,5552	-93,4645

➔ There is a significant difference between the mean energy intake of Vietnamese men and the reference value (significance value < 0.05). The men have on average a lower total energy intake than the recommended intake.

WOMEN

For the women a daily energy requirement of 1800 kcal (PAL 1.4; Age: 25 to under 51 years) was taken into calculation.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Energie (Kilokalorien) kcal	25	1515,7495	461,83966	92,36793

Test bei einer Stichprobe

	Testwert = 1800					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Energie (Kilokalorien) kcal	-3,077	24	,005	-284,25045	-474,8885	-93,6124

➔ Vietnamese women had a similar result as the men. The total energy intake among female Vietnamese is significantly lower than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Energie (Kilokalorien) kcal	1	17	1880,4901	634,14128	153,80185
	2	25	1515,7495	461,83966	92,36793

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Energie (Kilokalorien) kcal	Varianzgleichheit angenommen	,865	,358	2,159	40	,037	364,74058	168,94779	23,28435	706,19680
	Varianzgleichheit nicht angenommen			2,033	27,259	,052	364,74058	179,40692	-3,20841	732,68956

➔ There is no significant difference in the intake of energy between the sexes.

Tests der Zwischensubjekteffekte

Abhängige Variable: Energie (Kilokalorien) kcal

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	1845029,17[a]	2	922514,587	3,255	,049
Konstanter Term	18517924,79	1	18517924,79	65,331	,000
Age	498834,713	1	498834,713	1,760	,192
Sex1male2female	974984,040	1	974984,040	3,440	,071
Fehler	11054428,81	39	283446,893		
Gesamtsumme	129106813,8	42			
Korrigierter Gesamtwert	12899457,99	41			

a. R-Quadrat = ,143 (Angepasstes R-Quadrat = ,099)

➔ There is no significant influence of the sex or the age on the energy intake of the Vietnamese sample group.

4.4.1.2 Protein

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eiweiß (Protein) mg	17	90136,6894	36582,70153	8872,60838

Test bei einer Stichprobe

	Testwert = 57000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Eiweiß (Protein) mg	3,735	16	,002	33136,68938	14327,5999	51945,7789

*Reference value for 19 to under 51 years old were used

➔ There is a significant difference in the protein intake of male Vietnamese in comparison with the reference value. The mean intake of protein is among male Vietnamese much higher than the recommended intake. Vietnamese men eat on average more than 1.5 times the recommended amount of protein.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eiweiß (Protein) mg	25	66084,0595	21902,78550	4380,55710

Test bei einer Stichprobe

	Testwert = 48000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Eiweiß (Protein) mg	4,128	24	,000	18084,05950	9043,0340	27125,0850

*Reference value for 19 to under 51 years old were used

➔ Similar results were found for female Vietnamese. The mean intake of protein among female Vietnamese is significant higher than the recommended intake. However, the mean value difference is not as high as for men.

SEX DIFFERENCE

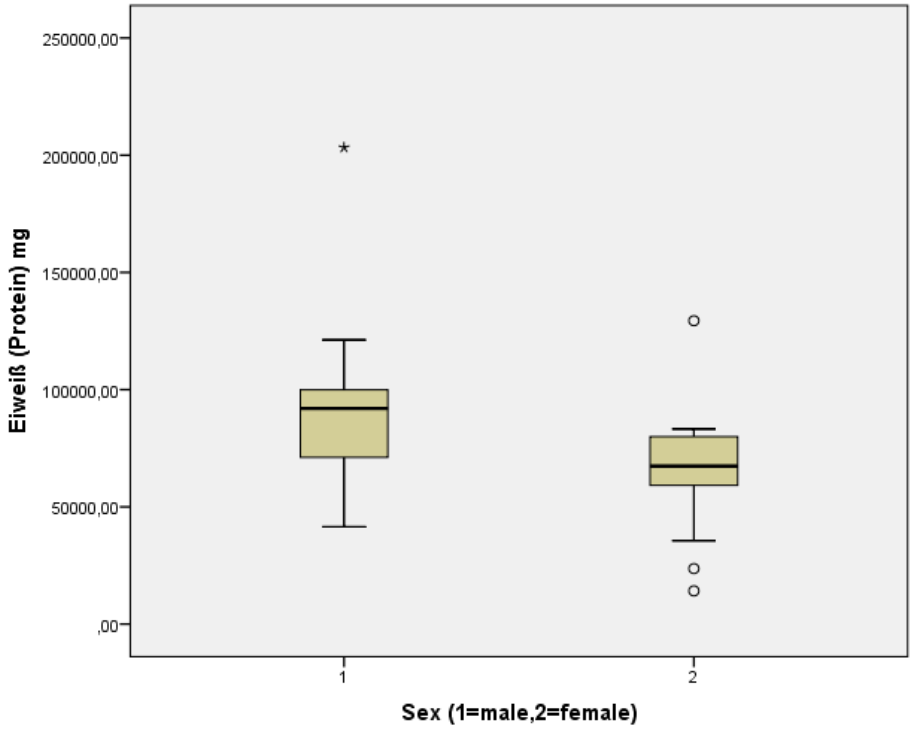
Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eiweiß (Protein) mg	1	17	90136,6894	36582,70153	8872,60838
	2	25	66084,0595	21902,78550	4380,55710

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Eiweiß (Protein) mg	Varianzgleichheit angenommen	1,902	,176	2,667	40	,011	24052,62988	9019,27176	5824,00170	42281,25806
	Varianzgleichheit nicht angenommen			2,431	23,808	,023	24052,62988	9895,07251	3621,47651	44483,78325

➔ The intake of protein is among male Vietnamese significantly higher compared to the female group.



Tests der Zwischensubjekteffekte

Abhängige Variable: Eiweiß (Protein) mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	6774252922[a]	2	3387126461	4,127	,024
Konstanter Term	3,838E+10	1	3,838E+10	46,769	,000
Age	920090380,8	1	920090380,8	1,121	,296
Sex1male2female	4692579525	1	4692579525	5,718	,022
Fehler	3,201E+10	39	820671352,2		
Gesamtsumme	2,802E+11	42			
Korrigierter Gesamtwert	3,878E+10	41			

a. R-Quadrat = ,175 (Angepasstes R-Quadrat = ,132)

➔ As the result above show, the gender has a significant influence on the protein intake in the sample group. But there are no significant differences between the ages.

4.4.1.3 Fat

The fat intake is recommended to be not more than 30% of the total energy intake.

MEN

For men with a daily energy intake of 2300 kcal the fat intake should be maximum 75.9g

per day (1 kcal = 0.11g fat).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Fett mg	17	63925,0119	25122,65423	6093,13865

Test bei einer Stichprobe

	Testwert = 75900					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Fett mg	-1,965	16	,067	-11974,98813	-24891,8650	941,8888

➔ There is no significant difference in the fat intake among male Vietnamese compared to the reference value.

WOMEN

For women with a daily energy intake of 1800 kcal the fat intake should be maximum 59.4g per day (1 kcal = 0.11g fat).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Fett mg	25	56886,6784	19834,75248	3966,95050

Test bei einer Stichprobe

	Testwert = 59400					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Fett mg	-,634	24	,532	-2513,32161	-10700,7050	5674,0618

➔ Similar results were found for female Vietnamese. There is no significant difference in the mean intake of fat compared to the reference intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Fett mg	1	17	63925,0119	25122,65423	6093,13865
	2	25	56886,6784	19834,75248	3966,95050

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Fett mg	Varianzgleichheit angenommen	,851	,362	1,013	40	,317	7038,33348	6948,11035	-7004,32137	21080,98832
	Varianzgleichheit nicht angenommen			,968	28,969	,341	7038,33348	7270,69700	-7832,61011	21909,27706

➔ There is no significant difference in fat intake between the sexes in the sample group.

Tests der Zwischensubjekteffekte

Abhängige Variable: Fett mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	1037249703[a]	2	518624851,3	1,064	,355
Konstanter Term	2,287E+10	1	2,287E+10	46,926	,000
Age	535970923,9	1	535970923,9	1,100	,301
Sex1male2female	291307905,4	1	291307905,4	,598	,444
Fehler	1,900E+10	39	487292587,4		
Gesamtsumme	1,699E+11	42			
Korrigierter Gesamtwert	2,004E+10	41			

a. R-Quadrat = ,052 (Angepasstes R-Quadrat = ,003)

➔ There is no significant influence of the sex or the age on the intake of fat amongst the Vietnamese.

Zusammenfassung von Fällen

Sex (1=male,2=female)		Gesättigte Fettsäuren mg	Einfach ungesättigte Fettsäuren mg	Mehrfach ungesättigte Fettsäuren mg
1	H	17	17	17
	Mittelwert	26725,2301	23102,6152	9247,8715
	Median	26154,0927	20559,9573	9921,4563
	Standardabweichung	12422,75144	9564,40303	3695,61919
	Minimum	11933,53	8369,96	3807,27
	Maximum	57985,76	42319,65	14294,31
2	H	25	25	25
	Mittelwert	24072,0003	19234,1731	9256,9676
	Median	21135,5825	19073,5700	8121,0242
	Standardabweichung	10992,81915	5846,25029	3875,87493
	Minimum	6241,89	7612,12	3067,32
	Maximum	55300,93	32403,94	17939,23
Gesamtsumme	H	42	42	42
	Mittelwert	25145,9267	20799,9711	9253,2859
	Median	24605,4064	19520,4075	8205,8241
	Standardabweichung	11519,48522	7707,07985	3758,11386
	Minimum	6241,89	7612,12	3067,32
	Maximum	57985,76	42319,65	17939,23

4.4.1.4 Saturated fatty acids

The saturated fatty acids should not account for more than 10% of the total energy intake.

MEN

For men with a daily energy intake of 2300 kcal, the intake of saturated fatty acids should be maximum 25.3g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Gesättigte Fettsäuren mg	17	26725,2301	12422,75144	3012,95978

Test bei einer Stichprobe

	Testwert = 25300					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Gesättigte Fettsäuren mg	,473	16	,643	1425,23009	-4961,9593	7812,4195

➔ There is no significant difference between the mean intake of saturated fatty acids among male subjects and the reference value.

WOMEN

For women with a daily mean energy intake of 1800 kcal, the saturated fatty acids intake should be maximum 19.8g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Gesättigte Fettsäuren mg	25	24072,0003	10992,81915	2198,56383

Test bei einer Stichprobe

	Testwert = 19800					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Gesättigte Fettsäuren mg	1,943	24	,064	4272,00034	-265,6124	8809,6131

➔ Similar result as for the men. The mean intake of saturated fatty acids among the female subjects is higher compared to the reference intake, but not significantly.

Whereas, the mean value difference is in the female group higher than among the males.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Gesättigte Fettsäuren mg	1	17	26725,2301	12422,75144	3012,95978
	2	25	24072,0003	10992,81915	2198,56383

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Gesättigte Fettsäuren mg	Varianzgleichheit angenommen	,005	,941	,728	40	,471	2653,22975	3642,19588	-4707,92270	10014,38220
	Varianzgleichheit nicht angenommen			,711	31,602	,482	2653,22975	3729,82702	-4947,93346	10254,39296

➔ There is no significant difference in the intake of saturated fatty acids between the sexes.

4.4.1.5 Monounsaturated fatty acids

Zusammenfassung von Fällen

Einfach ungesättigte Fettsäuren mg

Sex (1=male,2=female)	H	Mittelwert	Median	Standardabweichung	Minimum	Maximum
1	17	23102,6152	20559,9573	9564,40303	8369,96	42319,65
2	25	19234,1731	19073,5700	5846,25029	7612,12	32403,94
Gesamtsumme	42	20799,9711	19520,4075	7707,07985	7612,12	42319,65

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Einfach ungesättigte Fettsäuren mg	1	17	23102,6152	9564,40303	2319,70847
	2	25	19234,1731	5846,25029	1169,25006

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Einfach ungesättigte Fettsäuren mg	Varianzgleichheit angenommen	6,418	,015	1,629	40	,111	3868,44207	2375,42760	-932,47619	8669,36033
	Varianzgleichheit nicht angenommen			1,489	24,125	,149	3868,44207	2597,72844	-1491,53894	9228,42308

➔ The mean intakes of monounsaturated fatty acids are not significantly different between the male and the female subject group.

4.4.1.6 *Polyunsaturated fatty acids*

Zusammenfassung von Fällen

Mehrfach ungesättigte Fettsäuren mg

Sex (1=male,2=female)	H	Mittelwert	Median	Standardabweichung	Minimum	Maximum
1	17	9247,8715	9921,4563	3695,61919	3807,27	14294,31
2	25	9256,9676	8121,0242	3875,87493	3067,32	17939,23
Gesamtsumme	42	9253,2859	8205,8241	3758,11386	3067,32	17939,23

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Mehrfach ungesättigte Fettsäuren mg	1	17	9247,8715	3695,61919	896,31931
	2	25	9256,9676	3875,87493	775,17499

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Mehrfach ungesättigte Fettsäuren mg	Varianzgleichheit angenommen	,045	,833	-,008	40	,994	-9,09616	1196,08414	-2426,47239	2408,28006
	Varianzgleichheit nicht angenommen			-,008	35,606	,994	-9,09616	1185,02513	-2413,36235	2395,17002

➔ No significant difference in the intake of polyunsaturated fatty acids between the sexes.

4.4.1.7 *Cholesterol*

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Cholesterin mg	42	345,2526	161,12723	24,86247

Test bei einer Stichprobe

	Testwert = 300					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Cholesterin mg	1,820	41	,076	45,25259	-4,9582	95,4634

➔ The mean intake of cholesterol in the sample group is higher than the reference value. However, this difference is not significant.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Cholesterin mg	1	17	379,4452	151,28773	36,69266
	2	25	322,0016	166,43859	33,28772

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Cholesterin mg	Varianzgleichheit angenommen	,014	,906	1,138	40	,262	57,44354	50,47081	-44,56177	159,44884
	Varianzgleichheit nicht angenommen			1,159	36,632	,254	57,44354	49,54214	-42,97241	157,85948

➔ The mean cholesterol intake among the male and female group are not significantly different.

Tests der Zwischensubjekteffekte

Abhängige Variable: Cholesterin mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	36356,251[a]	2	18178,125	,690	,508
Konstanter Term	644331,063	1	644331,063	24,442	,000
Age	2965,823	1	2965,823	,113	,739
Sex1male2female	28006,525	1	28006,525	1,062	,309
Fehler	1028085,089	39	26361,156		
Gesamtsumme	6070813,952	42			
Korrigierter Gesamtwert	1064441,340	41			

a. R-Quadrat = ,034 (Angepasstes R-Quadrat = -,015)

➔ Neither the sex nor the age have a significant influence on the intake of cholesterol in the sample group.

4.4.1.8 Carbohydrate

The carbohydrate intake should account for more than 50% of the total energy intake.

MEN

For men with a daily energy intake of 2300 kcal the intake of carbohydrates should be at minimum 276g per day (1 kcal = 0.24g carbohydrates).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Kohlenhydrate, resorbierbar mg	17	221935,4634	110542,6381	26810,52783

Test bei einer Stichprobe

	Testwert = 276000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Kohlenhydrate, resorbierbar mg	-2,017	16	,061	-54064,53661	-110900,3166	2771,2434

➔ There is no significant difference in the carbohydrate intake among the male group and the recommended value. However, the mean carbohydrate intake is lower than the recommended value. To reach the actual reference intake the mean intake of carbohydrates in the male group should be significantly higher.

WOMEN

For women with a daily energy intake of 1800 kcal the carbohydrate intake should be at minimum 216g per day (1 kcal = 0.24g carbohydrates).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Kohlenhydrate, resorbierbar mg	25	171139,2002	53965,19563	10793,03913

Test bei einer Stichprobe

	Testwert = 216000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Kohlenhydrate, resorbierbar mg	-4,156	24	,000	-44860,79985	-67136,5378	-22585,0619

➔ In the female group the intake of carbohydrates is significantly lower than the calculation value. Therefore, this group does not meet the actual reference intake for carbohydrates.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Kohlenhydrate, resorbierbar mg	1	17	221935,4634	110542,6381	26810,52783
	2	25	171139,2002	53965,19563	10793,03913

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Kohlenhydrate, resorbierbar mg	Varianzgleichheit angenommen	3,025	,090	1,984	40	,054	50796,26324	25606,94044	-957,29390	102549,8204
	Varianzgleichheit nicht angenommen			1,758	21,234	,093	50796,26324	28901,45492	-9267,23737	110859,7638

➔ The intake of carbohydrates is not significantly different between the sexes.

Tests der Zwischensubjekteffekte

Abhängige Variable: Kohlenhydrate, resorbierbar mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	2,958E+10[a]	2	1,479E+10	2,202	,124
Konstanter Term	2,271E+11	1	2,271E+11	33,813	,000
Age	3470723697	1	3470723697	,517	,477
Sex1male2female	2,124E+10	1	2,124E+10	3,163	,083
Fehler	2,619E+11	39	6716356153		
Gesamtsumme	1,835E+12	42			
Korrigierter Gesamtwert	2,915E+11	41			

a. R-Quadrat = ,101 (Angepasstes R-Quadrat = ,055)

➔ There is no significant influence of the sex or the age on the intake of carbohydrates in the sample group.

4.4.1.9 Sugar

The sugar intake should not be higher than 10% of the total energy intake.

MEN

For men with a daily energy intake of 2300 kcal the intake of sugar should be at maximum 55.2g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zucker (gesamt) mg	17	91299,1841	78666,22698	19079,36253

Test bei einer Stichprobe

	Testwert = 55200					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Zucker (gesamt) mg	1,892	16	,077	36099,18405	-4347,2577	76545,6258

➔ The mean intake of sugar in the male group is higher than the reference value. However, the result is not significant.

WOMEN

For women with a daily energy intake of 1800 kcal the intake of sugar should be at maximum 43.2g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zucker (gesamt) mg	25	66068,1126	31642,00226	6328,40045

Test bei einer Stichprobe

	Testwert = 43200					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Zucker (gesamt) mg	3,614	24	,001	22868,11261	9806,9360	35929,2892

➔ The mean sugar intake in the female group is significantly higher than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zucker (gesamt) mg	1	17	91299,1841	78666,22698	19079,36253
	2	25	66068,1126	31642,00226	6328,40045

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Zucker (gesamt) mg	Varianzgleichheit angenommen	3,651	,063	1,447	40	,156	25231,07144	17435,28238	-10006,94870	60469,09158
	Varianzgleichheit nicht angenommen			1,255	19,556	,224	25231,07144	20101,51056	-16761,00208	67223,14495

➔ There is no significant difference in the intake of sugar between the sexes.

4.4.1.10 Dietary fiber

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Ballaststoffe mg	42	14387,3490	6912,22409	1066,57933

Test bei einer Stichprobe

	Testwert = 30000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Ballaststoffe mg	-14,638	41	,000	-15612,65100	-17766,6517	-13458,6503

➔ The mean intake of fiber in the sample group is 14.4g per day. There is a significant difference to the recommended intake of 30g/day. The Vietnamese eat less than half of the recommended amount of dietary fiber.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Ballaststoffe mg	1	17	14146,9056	8692,34371	2108,20301
	2	25	14550,8505	5584,09926	1116,81985

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Ballaststoffe mg	Varianzgleichheit angenommen	1,362	,250	-,184	40	,855	-403,94487	2199,00803	-4848,30589	4040,41616
	Varianzgleichheit nicht angenommen			-,169	24,931	,867	-403,94487	2385,75073	-5318,17601	4510,28628

➔ There is no significant difference in the intake of dietary fiber between the sexes.

Tests der Zwischensubjekteffekte

Abhängige Variable: Ballaststoffe mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	26123871,4[a]	2	13061935,69	,264	,770
Konstanter Term	680395453,3	1	680395453,3	13,729	,001
Age	24472731,66	1	24472731,66	,494	,486
Sex1male2female	50543,740	1	50543,740	,001	,975
Fehler	1932808643	39	49559195,98		
Gesamtsumme	1,065E+10	42			
Korrigierter Gesamtwert	1958932514	41			

a. R-Quadrat = ,013 (Angepasstes R-Quadrat = -,037)

➔ Neither the sex nor the age have significant influence on the intake of dietary fiber in the Vietnamese sample group.

4.4.1.11 Alcohol

MEN

For men the maximum tolerable amount of alcohol is 20g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Alkohol (Ethanol) mg	17	4383,9356	7979,02648	1935,19818

Test bei einer Stichprobe

	Testwert = 20000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Alkohol (Ethanol) mg	-8,069	16	,000	-15616,06444	-19718,5013	-11513,6276

➔ The mean intake of alcohol in the male sample group is significantly lower than the maximum tolerable amount.

WOMEN

For women the maximum tolerable alcohol amount is 10g/day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Alkohol (Ethanol) mg	25	5640,8883	13537,34254	2707,46851

Test bei einer Stichprobe

	Testwert = 10000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Alkohol (Ethanol) mg	-1,610	24	,120	-4359,11171	-9947,0521	1228,8286

➔ For the women group the result is not significantly different compared to the maximum tolerable amount of alcohol.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Alkohol (Ethanol) mg	1	17	4383,9356	7979,02648	1935,19818
	2	25	5640,8883	13537,34254	2707,46851

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Alkohol (Ethanol) mg	Varianzgleichheit angenommen	,431	,515	-,344	40	,733	-1256,95272	3658,25825	-8650,56845	6136,66300
	Varianzgleichheit nicht angenommen			-,378	39,372	,708	-1256,95272	3327,96901	-7986,37160	5472,46615

➔ No significant difference in the intake of alcohol between the gender groups.

Tests der Zwischensubjekteffekte

Abhängige Variable: Alkohol (Ethanol) mg

Quelle	Typ III Quadratsumme	df	Quadratischer Mittelwert	F	Sig.
Korrigiertes Modell	403974520[a]	2	201987260,0	1,566	,222
Konstanter Term	857667084,7	1	857667084,7	6,651	,014
Age	387987131,6	1	387987131,6	3,009	,091
Sex1male2female	64306124,00	1	64306124,00	,499	,484
Fehler	5028882120	39	128945695,4		
Gesamtsumme	6539080916	42			
Korrigierter Gesamtwert	5432856640	41			

a. R-Quadrat = ,074 (Angepasstes R-Quadrat = ,027)

➔ There is no significant influence of the sex or the age on the alcohol intake in the sample group.

4.4.2 Essential fatty acids

Zusammenfassung von Fällen

Sex (1=male,2=female)		Octadecadiensäure/Linolsäure mg	Octadecatriensäure/Linolensäure mg	Eicosapentaensäure mg	Docosahexaensäure mg	EPS + DHS mg
1	H	17	17	17	17	17
	Mittelwert	6933,9534	1289,2754	176,8443	279,9121	456,7563
	Median	6703,0425	948,5967	88,0650	132,8100	225,8100
	Standardabweichung	2888,83031	878,76609	243,58025	332,22655	570,19307
	Minimum	2532,76	467,80	24,10	3,15	27,25
	Maximum	11289,60	3289,25	947,44	1354,14	2301,59
2	H	25	25	25	25	25
	Mittelwert	7024,3178	1215,9507	237,9249	345,0866	583,0115
	Median	6640,8261	928,3942	81,3875	171,3759	253,4509
	Standardabweichung	3273,70064	800,00835	323,74579	414,48828	734,16493
	Minimum	2182,62	438,66	3,44	5,25	31,19
	Maximum	14079,38	3550,71	1174,89	1344,20	2519,08
Gesamtsumme	H	42	42	42	42	42
	Mittelwert	6987,7417	1245,6297	213,2018	318,7064	531,9082
	Median	6659,6030	938,4955	81,7313	155,8472	234,9315
	Standardabweichung	3087,42081	822,99873	292,27977	380,37810	668,07293
	Minimum	2182,62	438,66	3,44	3,15	27,25
	Maximum	14079,38	3550,71	1174,89	1354,14	2519,08

4.4.2.1 Linoleic acid

The intake of linoleic acid should account for 2.5% of the total energy intake of an adult.

MEN

For men with a daily energy intake of 2300 kcal the linoleic acid intake should be 6.3g per day (1 kcal = 0.11g fat).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecadiensäure/Linolsäure mg	17	6933,9534	2888,83031	700,64426

Test bei einer Stichprobe

	Testwert = 6300					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Octadecadiensäure/Linolsäure mg	,905	16	,379	633,95337	-851,3461	2119,2529

➔ There is no significant difference in the mean intake of linoleic acid among male Vietnamese and the reference value.

WOMEN

For women with a daily energy intake of 1800 kcal the intake of linoleic acid should be 5g per day (1 kcal = 0.11g fat).

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecadiensäure/Linolsäure mg	25	7024,3178	3273,70064	654,74013

Test bei einer Stichprobe

	Testwert = 5000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Octadecadiensäure/Linolsäure mg	3,092	24	,005	2024,31778	673,0006	3375,6350

➔ The mean intake of linoleic acid among female Vietnamese is significant higher than the reference intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecadiensäure/Linolsäure mg	1	17	6933,9534	2888,83031	700,64426
	2	25	7024,3178	3273,70064	654,74013

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Octadecadiensäure/Linolsäure mg	Varianzgleichheit angenommen	,178	,676	-,092	40	,927	-90,36441	982,52141	-2076,11426	1895,38544
	Varianzgleichheit nicht angenommen			-,094	37,222	,925	-90,36441	958,95100	-2032,99216	1852,26334

➔ No significant different in the intake of linoleic acid between the sexes.

4.4.2.2 Alpha-Linolenic acid

The intake of α-linolenic acid should account for 0.5% of the total energy intake of an adult.

MEN

For men with a daily energy intake of 2300 kcal the α-linolenic acid intake should be 1.3g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecatriensäure/Linolensäure mg	17	1289,2754	878,76609	213,13208

Test bei einer Stichprobe

	Testwert = 1300					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Octadecatriensäure/Linolensäure mg	-,050	16	,960	-10,72457	-462,5444	441,0953

➔ The mean intake of α-linolenic acid is in the men group not significantly different in comparison with the recommended value.

WOMEN

For women with a daily energy intake of 1800 kcal the α-linolenic acid intake should be 1g per day.

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecatriensäure/Linolensäure mg	25	1215,9507	800,00835	160,00167

Test bei einer Stichprobe

	Testwert = 1000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Octadecatriensäure/Linolensäure mg	1,350	24	,190	215,95068	-114,2765	546,1779

➔ The mean intake of α-linolenic acid in the women group is higher compared to the reference intake. However, the result is not significant.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Octadecatriensäure/Linolensäure mg	1	17	1289,2754	878,76609	213,13208
	2	25	1215,9507	800,00835	160,00167

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Octadecatriensäure/Linolensäure mg	Varianzgleichheit angenommen	,259	,613	,280	40	,781	73,32475	261,67694	-455,54407	602,19357
	Varianzgleichheit nicht angenommen			,275	32,281	,785	73,32475	266,50670	-469,34640	615,99590

➔ The mean intakes of α-linolenic acid are not significantly different between the two groups.

4.4.2.3 EPA + DHA

Zusammenfassung von Fällen

Sex (1=male,2=female)		Eicosapentaensäure mg	Docosahexaensäure mg	EPS + DHS mg
1	H	17	17	17
	Mittelwert	176,8443	279,9121	456,7563
	Median	88,0650	132,8100	225,8100
	Standardabweichung	243,58025	332,22655	570,19307
	Minimum	24,10	3,15	27,25
	Maximum	947,44	1354,14	2301,59
2	H	25	25	25
	Mittelwert	237,9249	345,0866	583,0115
	Median	81,3875	171,3759	253,4509
	Standardabweichung	323,74579	414,48828	734,16493
	Minimum	3,44	5,25	31,19
	Maximum	1174,89	1344,20	2519,08
Gesamtsumme	H	42	42	42
	Mittelwert	213,2018	318,7064	531,9082
	Median	81,7313	155,8472	234,9315
	Standardabweichung	292,27977	380,37810	668,07293
	Minimum	3,44	3,15	27,25
	Maximum	1174,89	1354,14	2519,08

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
EPS + DHS mg	42	531,9082	668,07293	103,08589

Test bei einer Stichprobe

	Testwert = 250					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
EPS + DHS mg	2,735	41	,009	281,90822	73,7220	490,0944

➔ The mean intake of EPA + DHA in the Vietnamese sample group is significantly higher than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
EPS + DHS mg	1	17	456,7563	570,19307	138,29213
	2	25	583,0115	734,16493	146,83299

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
EPS + DHS mg	Varianzgleichheit angenommen	1,635	,208	-,596	40	,554	-126,25514	211,68662	-554,08977	301,57949
	Varianzgleichheit nicht angenommen			-,626	39,198	,535	-126,25514	201,70434	-534,17477	281,66449

➔ There is no significant difference in the mean intakes of EPA + DHA between the males and females in the sample group.

4.4.3 Lipo-soluble vitamins

Zusammenfassung von Fällen

Sex (1=male,2=female)		Vitamin A µg	Vitamin A Beta-Carotin µg	Vitamin D Calciferole µg	Vitamin E µg	Vitamin K Phyllochinon µg
1	H	17	17	17	17	17
	Mittelwert	1097,8820	2540,7850	1,6062	16883,8419	87,8150
	Median	993,8781	1538,7958	1,3186	11075,5914	61,8216
	Standardabweichung	855,63878	2350,43582	1,20083	10663,64488	79,54415
	Minimum	56,73	106,84	,14	6132,55	5,91
	Maximum	3613,73	7422,13	3,86	40861,72	310,98
2	H	25	25	25	25	25
	Mittelwert	1436,3211	3212,8654	2,1992	19183,3905	134,6811
	Median	932,7360	3282,5200	1,9380	18027,5165	75,7689
	Standardabweichung	1844,31133	1913,45272	1,49398	11910,97105	143,11274
	Minimum	359,66	546,41	,16	8490,09	15,58
	Maximum	9562,80	8144,65	5,52	67565,52	661,22
Gesamtsumme	H	42	42	42	42	42
	Mittelwert	1299,3338	2940,8328	1,9592	18252,6208	115,7115
	Median	952,3192	2325,6378	1,7178	14508,7452	67,3601
	Standardabweichung	1518,25118	2100,14344	1,39858	11345,81846	122,47572
	Minimum	56,73	106,84	,14	6132,55	5,91
	Maximum	9562,80	8144,65	5,52	67565,52	661,22

4.4.3.1 Vitamin A

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin A µg	17	1097,8820	855,63878	207,52289

Test bei einer Stichprobe

	Testwert = 1000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin A µg	,472	16	,644	97,88200	-342,0469	537,8109

➔ The mean intake of vitamin A among Vietnamese men is not significantly different than the reference intake.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin A µg	25	1436,3211	1844,31133	368,86227

Test bei einer Stichprobe

	Testwert = 800					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin A µg	1,725	24	,097	636,32110	-124,9732	1397,6154

➔ Similar result for Vietnamese women. Although, the mean value difference is much higher in the women group, the result is not significantly higher compared to the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin A µg	1	17	1097,8820	855,63878	207,52289
	2	25	1436,3211	1844,31133	368,86227

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin A µg	Varianzgleichheit angenommen	,975	,329	-,705	40	,485	-338,43909	480,23764	-1309,03557	632,15739
	Varianzgleichheit nicht angenommen			-,800	36,163	,429	-338,43909	423,23176	-1196,65858	519,78040

➔ There is no significant difference in the intake of vitamin A between the male and female group.

4.4.3.2 Beta-carotene

Recommended intake: 2-4 mg/day for adults

Zusammenfassung von Fällen

Vitamin A Beta-Carotin µg

Sex (1=male,2=female)	H	Mittelwert	Median	Standardabweichung	Minimum	Maximum
1	17	2540,7850	1538,7958	2350,43582	106,84	7422,13
2	25	3212,8654	3282,5200	1913,45272	546,41	8144,65
Gesamtsumme	42	2940,8328	2325,6378	2100,14344	106,84	8144,65

➔ The mean intakes of beta-carotene among Vietnamese men and women are in the reference range.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin A Beta-Carotin µg	1	17	2540,7850	2350,43582	570,06442
	2	25	3212,8654	1913,45272	382,69054

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin A Beta-Carotin µg	Varianzgleichheit angenommen	1,544	,221	-1,018	40	,315	-672,08039	659,90589	-2005,79995	661,63916
	Varianzgleichheit nicht angenommen			-,979	29,655	,336	-672,08039	686,60432	-2074,99716	730,83637

➔ There is no significant difference in the intake of beta-carotene between the sexes.

4.4.3.3 *Vitamin D*

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin D Calciferole µg	42	1,9592	1,39858	,21581

Test bei einer Stichprobe

	Testwert = 20					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin D Calciferole µg	-83,598	41	,000	-18,04083	-18,4767	-17,6050

➔ The mean intake of vitamin D in the sample group is 2µg per day, which is significantly lower than the recommended intake of 20µg per day.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin D Calciferole µg	1	17	1,6062	1,20083	,29124
	2	25	2,1992	1,49398	,29880

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin D Calciferole µg	Varianzgleichheit angenommen	,776	,384	-1,363	40	,181	-,59293	,43514	-1,47238	,28651
	Varianzgleichheit nicht angenommen			-1,421	38,772	,163	-,59293	,41726	-1,43707	,25121

➔ No significant difference in the intake of vitamin D between the men and women group.

4.4.3.4 *Vitamin E*

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin E µg	17	16883,8419	10663,64488	2586,31378

Test bei einer Stichprobe

	Testwert = 14000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin E µg	1,115	16	,281	2883,84190	-2598,8984	8366,5822

*Reference value for 25 to under 51 years old were used

➔ The mean intake of vitamin E is higher than the reference value among the Vietnamese men, but not significantly.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin E µg	25	19183,3905	11910,97105	2382,19421

Test bei einer Stichprobe

	Testwert = 12000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin E µg	3,015	24	,006	7183,39048	2266,7833	12099,9977

*Reference value for 25 to under 51 years old were used

➔ In the women group the mean intake of vitamin E is significantly higher than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin E µg	1	17	16883,8419	10663,64488	2586,31378
	2	25	19183,3905	11910,97105	2382,19421

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin E µg	Varianzgleichheit angenommen	,287	,595	-,640	40	,526	-2299,54858	3592,65225	-9560,56963	4961,47248
	Varianzgleichheit nicht angenommen			-,654	36,939	,517	-2299,54858	3516,22926	-9424,50006	4825,40290

➔ The male and female group are not significantly different in the intake of vitamin E.

4.4.3.5 Vitamin K

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin K Phyllochinon µg	17	87,8150	79,54415	19,29229

Test bei einer Stichprobe

	Testwert = 70					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin K Phyllochinon µg	,923	16	,370	17,81495	-23,0829	58,7128

*Reference value for 19 to under 51 years old were used

➔ The mean intake of vitamin K is among male Vietnamese higher than the reference intake, but not significantly higher.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin K Phyllochinon µg	25	134,6811	143,11274	28,62255

Test bei einer Stichprobe

	Testwert = 60					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin K Phyllochinon µg	2,609	24	,015	74,68113	15,6071	133,7552

*Reference value for 19 to under 51 years old were used

➔ For female Vietnamese the mean intake of vitamin K is significantly higher than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin K Phyllochinon µg	1	17	87,8150	79,54415	19,29229
	2	25	134,6811	143,11274	28,62255

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin K Phyllochinon µg	Varianzgleichheit angenommen	2,180	,148	-1,225	40	,228	-46,86618	38,26920	-124,21111	30,47876
	Varianzgleichheit nicht angenommen			-1,358	38,760	,182	-46,86618	34,51728	-116,69777	22,96542

➔ There is no significant difference in the intake of vitamin K between the two groups.

4.4.4 Water-soluble vitamins

Zusammenfassung von Fällen

Sex (1=male,2=female)		Vitamin B1 Thiamin µg	Vitamin B2 Riboflavin µg	Vitamin B3 µg	Vitamin B5 Pantothensäure µg	Vitamin B6 Pyridoxin µg	Vitamin B7 Biotin (Vitamin H) µg	Vitamin B9 gesamte Folsäure µg	Vitamin B12 Cobalamin µg	Vitamin C Ascorbinsäure µg
1	H	17	17	17	17	17	17	17	17	17
	Mittelwert	1515,8163	1344,9559	60033,5222	5018,5177	1815,2374	51,3152	196,0751	4,5126	113388,4858
	Median	932,7477	1319,9538	51120,7007	3723,3182	1417,5588	35,1224	157,3597	4,8377	56507,0542
	Standardabweichung	1238,33123	602,65260	32470,98039	2998,44878	1178,64035	53,31599	103,31565	1,76445	190228,7831
	Minimum	449,42	626,51	26706,77	2217,37	710,60	15,11	98,34	1,14	18198,40
	Maximum	4414,21	2729,79	151572,22	12498,90	4478,89	227,42	410,85	7,38	827390,68
2	H	25	25	25	25	25	25	25	25	25
	Mittelwert	1110,9897	1106,1381	42590,6353	3779,4094	1465,1574	45,9940	215,5369	5,4590	99201,9389
	Median	946,7668	921,7887	39045,4707	3320,2298	1264,6176	32,1116	195,3944	3,6585	76249,7092
	Standardabweichung	898,40076	637,32563	20045,15822	2676,25355	966,70910	65,03975	118,22383	6,68873	66086,30798
	Minimum	384,17	336,60	12694,02	1166,04	640,60	8,86	61,03	,56	23676,50
	Maximum	4921,45	3660,74	117647,81	15728,12	5483,83	346,63	612,39	34,36	260593,58
Gesamtsumme	H	42	42	42	42	42	42	42	42	42
	Mittelwert	1274,8481	1202,8024	49650,8514	4280,9532	1606,8564	48,1479	207,6595	5,0759	104944,1127
	Median	939,7572	1019,6718	43618,5019	3406,1323	1325,0536	34,3698	166,6107	3,8572	71636,4127
	Standardabweichung	1054,19901	627,35580	26865,51770	2842,55036	1058,02249	59,93738	111,53733	5,25593	129336,5794
	Minimum	384,17	336,60	12694,02	1166,04	640,60	8,86	61,03	,56	18198,40
	Maximum	4921,45	3660,74	151572,22	15728,12	5483,83	346,63	612,39	34,36	827390,68

4.4.4.1 Vitamin B1

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B1 Thiamin µg	17	1515,8163	1238,33123	300,33944

Test bei einer Stichprobe

	Testwert = 1200					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B1 Thiamin µg	1,052	16	,309	315,81630	-320,8749	952,5075

*Reference value for 25 to under 65 years old were used

➔ The mean intake of vitamin B1 is not significantly different among the male subjects compared to the reference value.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B1 Thiamin µg	25	1110,9897	898,40076	179,68015

Test bei einer Stichprobe

	Testwert = 1000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B1 Thiamin µg	,618	24	,543	110,98973	-259,8519	481,8313

*Reference value for 25 to under 65 years old were used

➔ Similar result were found for female subjects. No significant difference in the intake of vitamin K in comparison with the reference intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B1 Thiamin µg	1	17	1515,8163	1238,33123	300,33944
	2	25	1110,9897	898,40076	179,68015

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin B1 Thiamin µg	Varianzgleichheit angenommen	4,373	,043	1,229	40	,226	404,82658	329,35488	-260,82447	1070,47763
	Varianzgleichheit nicht angenommen			1,157	27,181	,257	404,82658	349,98391	-313,05683	1122,70999

➔ No significant gender differences in the intake of vitamin B1.

4.4.4.2 *Vitamin B2*

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B2 Riboflavin µg	17	1344,9559	602,65260	146,16473

Test bei einer Stichprobe

	Testwert = 1400					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B2 Riboflavin µg	-,377	16	,711	-55,04410	-364,8995	254,8113

*Reference value for 19 to under 51 years old were used

➔ The mean intake of vitamin B2 in the men group is not significantly different from the reference value.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B2 Riboflavin µg	25	1106,1381	637,32563	127,46513

Test bei einer Stichprobe

	Testwert = 1100					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B2 Riboflavin µg	,048	24	,962	6,13807	-256,9370	269,2132

*Reference value for 19 to under 51 years old were used

➔ Similar result as in the male group. In the women group the mean intake of vitamin B2 is also not significantly different compared to the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B2 Riboflavin µg	1	17	1344,9559	602,65260	146,16473
	2	25	1106,1381	637,32563	127,46513

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin B2 Riboflavin µg	Varianzgleichheit angenommen	,551	,462	1,218	40	,230	238,81783	196,06380	-157,44189	635,07755
	Varianzgleichheit nicht angenommen			1,231	35,790	,226	238,81783	193,93681	-154,58439	632,22005

➔ No significant gender differences in the intake of vitamin B2.

4.4.4.3 Niacin

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B3 µg	17	60033,5222	32470,98039	7875,36952

Test bei einer Stichprobe

	Testwert = 15000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B3 µg	5,718	16	,000	45033,52218	28338,4846	61728,5598

*Reference value for 25 to under 51 years old were used

➔ The mean intake of niacin is among Vietnamese men significantly higher than the reference intake. The result is more than 4 times higher than the reference value.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B3 µg	25	42590,6353	20045,15822	4009,03164

Test bei einer Stichprobe

	Testwert = 12000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B3 µg	7,630	24	,000	30590,63531	22316,4007	38864,8699

*Reference value for 25 to under 51 years old were used

➔ Similar result in the women group. Also Vietnamese women have a significantly higher intake of niacin compared to the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B3 µg	1	17	60033,5222	32470,98039	7875,36952
	2	25	42590,6353	20045,15822	4009,03164

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin B3 µg	Varianzgleichheit angenommen	4,404	,042	2,155	40	,037	17442,88687	8093,40990	1085,49530	33800,27844
	Varianzgleichheit nicht angenommen			1,974	24,280	,060	17442,88687	8837,06851	-784,80220	35670,57594

➔ There is no significant difference in the intake of niacin between the sexes.

4.4.4.4 Pantothenate

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B5 Pantothensäure µg	42	4280,9532	2842,55036	438,61504

Test bei einer Stichprobe

	Testwert = 6000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Vitamin B5 Pantothensäure µg	-3,919	41	,000	-1719,04679	-2604,8478	-833,2457

➔ The mean intake of pantothenate of the Vietnamese sample group is significantly lower in comparison with the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B5 Pantothensäure µg	1	17	5018,5177	2998,44878	727,23065
	2	25	3779,4094	2676,25355	535,25071

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin B5 Pantothensäure µg	Varianzgleichheit angenommen	2,807	,102	1,403	40	,168	1239,10833	883,22200	-545,94992	3024,16658
	Varianzgleichheit nicht angenommen			1,372	31,807	,180	1239,10833	902,97162	-600,62147	3078,83813

➔ There are no significant gender differences in the intake of pantothenate.

4.4.4.5 Vitamin B6

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B6 Pyridoxin µg	17	1815,2374	1178,64035	285,86227

Test bei einer Stichprobe

	Testwert = 1500					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B6 Pyridoxin µg	1,103	16	,286	315,23737	-290,7636	921,2383

*Reference value for 19 to under 65 years old were used

➔ In the male group the mean intake of vitamin B6 is higher than the reference intake. However, the result is not significant.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B6 Pyridoxin µg	25	1465,1574	966,70910	193,34182

Test bei einer Stichprobe

	Testwert = 1200					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin B6 Pyridoxin µg	1,371	24	,183	265,15740	-133,8805	664,1953

*Reference value for 19 to under 65 years old were used

➔ Similar result were found for Vietnamese women. In the female group the mean intake of vitamin B6 is higher compared to the reference value. But again the result is not significant.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B6 Pyridoxin µg	1	17	1815,2374	1178,64035	285,86227
	2	25	1465,1574	966,70910	193,34182

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin B6 Pyridoxin µg	Varianzgleichheit angenommen	1,921	,173	1,054	40	,298	350,07996	332,15344	-321,22718	1021,38711
	Varianzgleichheit nicht angenommen			1,014	29,826	,319	350,07996	345,10621	-354,89388	1055,05381

➔ No significant gender differences in the intake of vitamin B6 in the Vietnamese sample group.

4.4.4.6 *Biotin*

Recommended intake: 30-60 µg/day for adults

Zusammenfassung von Fällen

Vitamin B7 Biotin (Vitamin H) µg

Sex (1=male,2=female)	H	Mittelwert	Median	Standardabweichung	Minimum	Maximum
1	17	51,3152	35,1224	53,31599	15,11	227,42
2	25	45,9940	32,1116	65,03975	8,86	346,63
Gesamtsumme	42	48,1479	34,3698	59,93738	8,86	346,63

➔ The mean intakes of biotin among Vietnamese men and women are in the reference range.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B7 Biotin (Vitamin H) µg	1	17	51,3152	53,31599	12,93103
	2	25	45,9940	65,03975	13,00795

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin B7 Biotin (Vitamin H) µg	Varianzgleichheit angenommen	,088	,769	,279	40	,782	5,32117	19,05755	-33,19558	43,83792
	Varianzgleichheit nicht angenommen			,290	38,490	,773	5,32117	18,34171	-31,79416	42,43650

➔ No significant difference in the intake of biotin between males and females in the sample group.

4.4.4.7 *Folates*

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B9 gesamte Folsäure µg	42	207,6595	111,53733	17,21058

Test bei einer Stichprobe

	Testwert = 300					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Vitamin B9 gesamte Folsäure µg	-5,365	41	,000	-92,34049	-127,0980	-57,5830

➔ The mean intake of folates in the sample group is significantly lower than the reference value. On average the Vietnamese receive more than 90µg folates less than the recommended intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B9 gesamte Folsäure µg	1	17	196,0751	103,31565	25,05773
	2	25	215,5369	118,22383	23,64477

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin B9 gesamte Folsäure µg	Varianzgleichheit angenommen	,001	,981	-,550	40	,585	-19,46176	35,36507	-90,93723	52,01371
	Varianzgleichheit nicht angenommen			-,565	37,407	,576	-19,46176	34,45235	-89,24324	50,31972

➔ There are no significant gender differences in the intake of folates.

4.4.4.8 Vitamin B12

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B12 Cobalamin µg	42	5,0759	5,25593	,81101

Test bei einer Stichprobe

	Testwert = 3					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Vitamin B12 Cobalamin µg	2,560	41	,014	2,07592	,4381	3,7138

➔ The mean intake of vitamin B12 among Vietnamese is significantly higher compared to the reference intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin B12 Cobalamin µg	1	17	4,5126	1,76445	,42794
	2	25	5,4590	6,68873	1,33775

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Vitamin B12 Cobalamin µg	Varianzgleichheit angenommen	2,418	,128	-,568	40	,573	-,94646	1,66608	-4,31374	2,42082
	Varianzgleichheit nicht angenommen			-,674	28,712	,506	-,94646	1,40453	-3,82029	1,92737

➔ There is no significant difference in the intake of vitamin B12 between the sexes.

4.4.4.9 Vitamin C

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin C Ascorbinsäure µg	17	113388,4858	190228,7831	46137,25682

Test bei einer Stichprobe

	Testwert = 110000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin C Ascorbinsäure µg	,073	16	,942	3388,48577	-94418,1295	101195,1010

➔ In the men group the mean intake of vitamin C is not significantly different than the reference value.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin C Ascorbinsäure µg	25	99201,9389	66086,30798	13217,26160

Test bei einer Stichprobe

	Testwert = 95000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Vitamin C Ascorbinsäure µg	,318	24	,753	4201,93894	-23077,1483	31481,0261

➔ Similar result were found for the female group. Here, the mean intake of vitamin C is also not significantly different than the recommended intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Vitamin C Ascorbinsäure µg	1	17	113388,4858	190228,7831	46137,25682
	2	25	99201,9389	66086,30798	13217,26160

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Vitamin C Ascorbinsäure µg	Varianzgleichheit angenommen	1,978	,167	,345	40	,732	14186,54683	41102,45201	-68884,60741	97257,70107
	Varianzgleichheit nicht angenommen			,296	18,650	,771	14186,54683	47993,15025	-86391,92870	114765,0224

➔ No significant differences in the intake of vitamin C between the two groups.

4.4.5 Mineral nutrients

Zusammenfassung von Fällen

Sex (1=male,2=female)		Calcium mg	Kalium mg	Magnesium mg	Eisen µg	Zink µg	Iodid µg
1	H	17	17	17	17	17	17
	Mittelwert	533,2894	2306,6912	279,5897	10460,5370	11148,4251	89,2867
	Median	480,7963	2082,7112	251,5094	9835,3435	10243,5576	63,6647
	Standardabweichung	249,86502	1009,80992	123,49498	3511,55389	3612,42187	53,78072
	Minimum	224,76	1111,47	119,65	5804,79	6313,42	25,10
	Maximum	1126,39	5389,52	596,86	17995,11	22411,28	172,49
2	H	25	25	25	25	25	25
	Mittelwert	524,9515	2256,1675	247,7432	9504,0590	8964,6053	106,5746
	Median	456,8719	2305,6779	248,3217	9262,3940	8709,8075	77,9855
	Standardabweichung	229,92123	669,14858	80,06688	3104,84128	3489,82242	89,31405
	Minimum	210,38	940,65	89,93	4393,90	2027,90	24,72
	Maximum	983,64	3509,52	416,86	15289,12	16167,58	444,27
Gesamtsumme	H	42	42	42	42	42	42
	Mittelwert	528,3264	2276,6176	260,6334	9891,2048	9848,5324	99,5771
	Median	460,3210	2130,4015	248,9083	9518,8305	9869,5337	76,9615
	Standardabweichung	235,21419	812,81689	99,77241	3268,15578	3660,41633	76,62868
	Minimum	210,38	940,65	89,93	4393,90	2027,90	24,72
	Maximum	1126,39	5389,52	596,86	17995,11	22411,28	444,27

4.4.5.1 Calcium

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Calcium mg	42	528,3264	235,21419	36,29434

Test bei einer Stichprobe

	Testwert = 1000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Calcium mg	-12,996	41	,000	-471,67361	-544,9715	-398,3757

➔ The mean calcium intake of the sample group is significantly lower in comparison to the recommended intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Calcium mg	1	17	533,2894	249,86502	60,60117
	2	25	524,9515	229,92123	45,98425

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Calcium mg	Varianzgleichheit angenommen	,000	,984	,111	40	,912	8,33790	74,84939	-142,93837	159,61416
	Varianzgleichheit nicht angenommen			,110	32,538	,913	8,33790	76,07268	-146,51667	163,19246

➔ There are no significant gender differences in the intake of calcium.

4.4.5.2 Potassium

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Kalium mg	42	2276,6176	812,81689	125,42037

Test bei einer Stichprobe

	Testwert = 2000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Kalium mg	2,206	41	,033	276,61757	23,3260	529,9091

➔ The mean intakes of potassium among Vietnamese men and women are significantly higher than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Kalium mg	1	17	2306,6912	1009,80992	244,91488
	2	25	2256,1675	669,14858	133,82972

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Kalium mg	Varianzgleichheit angenommen	,768	,386	,195	40	,846	50,52375	258,56972	-472,06514	573,11265
	Varianzgleichheit nicht angenommen			,181	25,468	,858	50,52375	279,09441	-523,74724	624,79475

➔ The mean intakes of potassium are not significantly different between the men and the women group.

4.4.5.3 Magnesium

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Magnesium mg	17	279,5897	123,49498	29,95193

Test bei einer Stichprobe

	Testwert = 350					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Magnesium mg	-2,351	16	,032	-70,41028	-133,9055	-6,9150

*Reference value for 25 to 65 years and older were used

➔ The men sample group consume on average significantly less magnesium than the recommended amount.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Magnesium mg	25	247,7432	80,06688	16,01338

Test bei einer Stichprobe

	Testwert = 300					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Magnesium mg	-3,263	24	,003	-52,25683	-85,3068	-19,2069

*Reference value for 25 to 65 years and older were used

➔ Similar situation was found for women. The mean intake of magnesium in the female group is also significantly lower compared to the recommended intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Magnesium mg	1	17	279,5897	123,49498	29,95193
	2	25	247,7432	80,06688	16,01338

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Magnesium mg	Varianzgleichheit angenommen	1,400	,244	1,016	40	,316	31,84655	31,35252	-31,51926	95,21236
	Varianzgleichheit nicht angenommen			,938	25,087	,357	31,84655	33,96390	-38,09104	101,78414

➔ No significant gender differences in the intake of magnesium in the Vietnamese sample group.

4.4.5.4 Iron

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eisen µg	17	10460,5370	3511,55389	851,67692

Test bei einer Stichprobe

	Testwert = 10000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Eisen µg	,541	16	,596	460,53703	-1344,9374	2266,0114

*Reference value for 19 to under 51 years old were used

➔ The mean iron intake of male subjects is higher than the reference value. However, the result is not significant.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eisen µg	25	9504,0590	3104,84128	620,96826

Test bei einer Stichprobe

	Testwert = 15000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Eisen µg	-8,851	24	,000	-5495,94104	-6777,5565	-4214,3256

*Reference value for 19 to under 51 years old were used

➔ For the female subjects the mean intake of iron is significantly lower than the reference intake. Vietnamese women have on average a more than 5 mg less intake of iron than they should have.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Eisen µg	1	17	10460,5370	3511,55389	851,67692
	2	25	9504,0590	3104,84128	620,96826

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Eisen µg	Varianzgleichheit angenommen	,172	,680	,929	40	,358	956,47807	1029,09437	-1123,39924	3036,35538
	Varianzgleichheit nicht angenommen			,907	31,583	,371	956,47807	1054,01857	-1191,60047	3104,55661

➔ The mean iron intake in the women group is lower than in the men group, although the recommended intake for women is higher. However, the result is not significantly different between the two groups.

4.4.5.5 Zinc

MEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zink µg	17	11148,4251	3612,42187	876,14100

Test bei einer Stichprobe

	Testwert = 10000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Zink µg	1,311	16	,208	1148,42511	-708,9108	3005,7611

➔ The mean zinc intake among Vietnamese men is not significantly different compared to the reference intake.

WOMEN

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zink µg	25	8964,6053	3489,82242	697,96448

Test bei einer Stichprobe

	Testwert = 7000					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Zink µg	2,815	24	,010	1964,60533	524,0774	3405,1332

➔ The women group has a significantly higher intake of zinc in comparison with the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Zink µg	1	17	11148,4251	3612,42187	876,14100
	2	25	8964,6053	3489,82242	697,96448

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Zink µg	Varianzgleichheit angenommen	,159	,692	1,963	40	,057	2183,81978	1112,64436	-64,91836	4432,55792
	Varianzgleichheit nicht angenommen			1,950	33,703	,060	2183,81978	1120,16850	-93,37604	4461,01560

➔ Although the men have a higher mean intake of zinc than the women, the result is not significantly different between the two groups.

4.4.5.6 Iodine

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Iodid µg	42	99,5771	76,62868	11,82406

Test bei einer Stichprobe

	Testwert = 200					
					95% Konfidenzintervall der Differenz	
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Unterer	Oberer
Iodid µg	-8,493	41	,000	-100,42288	-124,3021	-76,5437

*Reference value for 19 to under 51 years old were used

➔ The mean iodine intake of the Vietnamese sample group is significantly lower than the recommended intake.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Iodid µg	1	17	89,2867	53,78072	13,04374
	2	25	106,5746	89,31405	17,86281

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
									95% Konfidenzintervall der Differenz	
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	Unterer	Oberer
Iodid µg	Varianzgleichheit angenommen	,608	,440	-,713	40	,480	-17,28788	24,23474	-66,26812	31,69236
	Varianzgleichheit nicht angenommen			-,782	39,551	,439	-17,28788	22,11830	-62,00646	27,43070

➔ There are no significant gender differences in the intake of iodine among the Vietnamese.

4.4.5.7 *Cooking salt – Sodium chloride*

Statistik bei einer Stichprobe

	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Gesamt-Kochsalz mg	42	4693,0730	1772,26471	273,46638

Test bei einer Stichprobe

	Testwert = 6000					
	t	df	Sig. (2-seitig)	Mittelwertdifferenz	95% Konfidenzintervall der Differenz	
					Unterer	Oberer
Gesamt-Kochsalz mg	-4,779	41	,000	-1306,92702	-1859,2036	-754,6505

➔ The mean intake of salt in the sample group is significantly lower than the reference value.

SEX DIFFERENCE

Gruppenstatistik

	Sex (1=male,2=female)	H	Mittelwert	Standardabweichung	Standardfehler Mittelwert
Gesamt-Kochsalz mg	1	17	5062,0384	2003,43851	485,90521
	2	25	4442,1765	1589,93615	317,98723

Test bei unabhängigen Stichproben

		Levene-Test der Varianzgleichheit		T-Test für die Mittelwertgleichheit						
		F	Sig.	t	df	Sig. (2-seitig)	Mittelwertdifferenz	Standardfehlerdifferenz	95% Konfidenzintervall der Differenz	
									Unterer	Oberer
Gesamt-Kochsalz mg	Varianzgleichheit angenommen	,514	,478	1,116	40	,271	619,86190	555,47387	-502,79268	1742,51647
	Varianzgleichheit nicht angenommen			1,067	29,083	,295	619,86190	580,70625	-567,66843	1807,39223

➔ No significant gender differences in the intake of salt.

4.5 Discussion

4.5.1 Energy and energy delivering nutrients

	WOMEN	D-A-CH 2015		MEN
		w	m	
Energy[1] (kcal)	1515*	1800	2300	1880*
Protein[2] (g)	66.1*	48	57	90.1*

[1] Reference value for the mean intake of energy in kcal for 25 to under 51 years old adults with a BMI in the normal area and with low physical activity (PAL 1.4)
[2] Reference value for 19 to under 51 years old were used

Fat[3] (g)	56.9	< 59.4	< 75.9	63.9
therefrom SFA[4] (g)	24.1	< 19.8	< 25.3	26.7
therefrom MUFA[5] (g)	19.2	19.8 - 25.7	25.3 - 32.9	23.1
therefrom PUFA[6] (g)	9.3	13.9 - 19.8	17.7 - 25.3	9.2
Cholesterol (mg)	322	300		379.4
Carbohydrates[7] (g)	171.1*	> 216	> 276	221.9
therefrom Sugar[8] (g)	66.1*	< 43.2	< 55.2	91.3
Dietary fiber (g)	14.6*	30		14.1*
Alcohol (g)	5.6	< 10	< 20	4.4*

SFA=saturated fatty acids, MUFA=monounsaturated fatty acids, PUFA=polyunsaturated fatty acids

Table 1: The daily intake of energy and energy delivering nutrients among Vietnamese

4.5.1.1 Energy

The mean intake of energy and energy delivering nutrients of the Vietnamese sample group is represented in Table 1.

The daily intake of energy in kcal among Vietnamese did not meet the reference values of D-A-CH 2015 with low physical activity. The women with 1515 kcal per day and the men with 1880 kcal per day, respectively, had a significantly lower intake than the recommended intake. There was no significant difference in the intake of energy between the Vietnamese men and women. Neither the sex nor the age played a significant role in the intake of energy among Vietnamese people.

4.5.1.2 Protein

The protein intake among male and female Vietnamese was significantly higher in comparison with the reference intake. Vietnamese men had a protein intake of 90.1g/day which is more than 1.5 times higher than the reference intake of 57g/day. Also the Vietnamese women had a significantly higher intake of protein with 66.1g/day

[3] Fat intake should be maximum 30% of total energy intake of an adult
[4] Intake of SFA should be maximum 10% of total energy intake
[5] Intake of MUFA should account for 10-13% of total energy intake
[6] Intake of PUFA should account for 7-10% of total energy intake
[7] Carbohydrate intake should account for more than 50% of total energy intake
[8] Intake of sugar should not be more than 10% of total energy intake

which also did not meet the reference value of 48g/day. The intake of protein among Vietnamese men was significantly higher than among the women. That means that the factor sex had significant influence on the intake of protein amongst Vietnamese. The age had no significant influence on the protein intake.

4.5.1.3 Fat

The Vietnamese intake of fat met the reference intake. The fat intake should not be higher than 30% of the total energy intake which was the case amongst Vietnamese men and women. The men had a fat intake of 63.9g per day and the women an intake of 56.9g per day. However, the result was in both group not significantly different from the reference value. Also there was no significant difference in the intake of fat between the male and female Vietnamese.

The intake of saturated fatty acids among Vietnamese men was 26.7g/day which was higher than the reference intake. A similar result was shown among Vietnamese women with an intake of 24.1g/day which was as well higher compared to the reference value. However, both results were not significant. There was also no significant difference in the intake of saturated fatty acids between the men and the women.

The intakes of monounsaturated fatty acids among both Vietnamese men and women were lower than the reference intakes. The men had an intake of 23.1g per day and the women 19.2 g per day. The intakes of monounsaturated fatty acids were not significantly different among male and female Vietnamese.

The Vietnamese also did not meet the reference intake of polyunsaturated fatty acids. The men with an intake of 9.2g/day and the women with 9.3g/day, respectively, were lower than the recommended intake. There was no significant difference in the intake of polyunsaturated fatty acids between Vietnamese men and women.

The reference intake for cholesterol is maximum 300mg per day for both men and women. The cholesterol intake of Vietnamese men and women were both higher in comparison with the reference value. Neither sex nor age had a significant influence on the intake of cholesterol among the Vietnamese.

4.5.1.4 Carbohydrates

The carbohydrate intake should account for more than 50% of the total energy intake. The Vietnamese men with an intake of 221.9g per day and the women with 171.1g per day were both lower than the reference value. The result for the Vietnamese women was significantly lower than the reference intake. Again, there was no significant difference between the male and female intake of carbohydrates among the Vietnamese.

The sugar intake of Vietnamese people were for both males and females higher than the recommended intake. The women with an intake of 66.1g/day had a significantly higher intake than the maximum value of 43.2g/day. The intakes of sugar were not significantly different between Vietnamese men and women.

4.5.1.5 Dietary fiber

Both Vietnamese men and women had a significantly lower intake of dietary fiber compared to the reference value. The men had an intake of 14.1g per day and the women 14.6g per day. The reference intake is amounted to 30g per day. The Vietnamese ate less than half of the recommended intake of dietary fiber.

4.5.1.6 Alcohol

For men the maximum tolerable amount of alcohol is 20g/day. The male Vietnamese had an intake of 4.4g per day which was significantly lower than the maximum value. For women the maximum tolerable amount of alcohol is at 10g/day. The female Vietnamese had an alcohol intake of 5.6g per day which was also lower than the maximum value, but not significant. There was no significant difference in the intake of alcohol between Vietnamese men and women.

4.5.2 Dietary energy intake/ energy proportion

The ideal distribution of the main nutrient for energy delivery should be according to the reference values for nutrient uptake from D-A-CH like this:

- ➔ Protein should make up to 10-15% of the total energy intake
- ➔ Fat should not account for more than 30% of the total energy intake
- ➔ Carbohydrates should be more than 50%, ideal up to 55-60% of the total energy

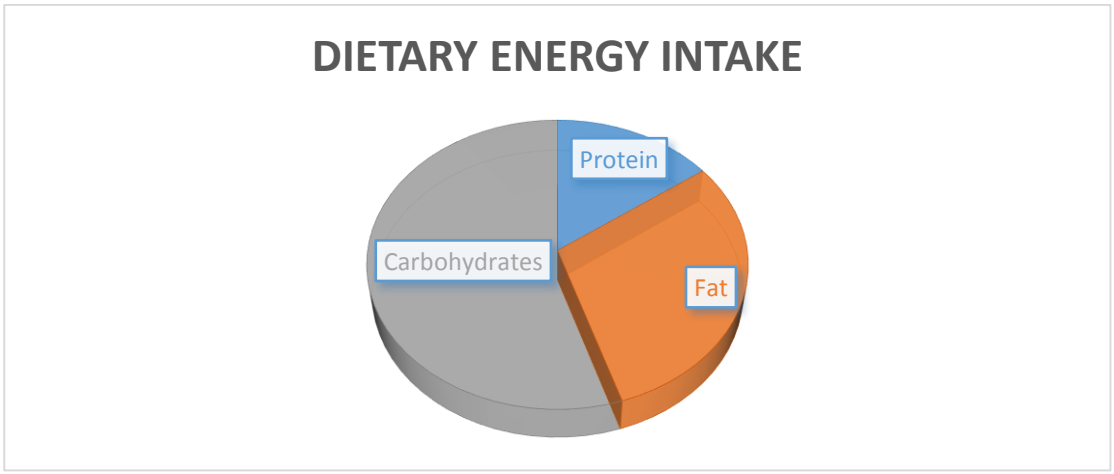


Figure 23: Dietary energy intake according to D-A-CH 2015

In the sample group the distribution looks like this:

The mean energy intake in the sample group is amount to 1663 kcal/day.

So the mean **protein** intake is 76g per day which are approximately 312 kcal (1g protein = 4.1 kcal). This would make up to **19%** of the mean total energy intake of the Vietnamese sample group.

The **fat** intake is 60g per day which are 558 kcal (1g fat = 9.3 kcal). Fat would make up to **34%** of the total energy intake in the sample group.

The mean intake of **carbohydrates** is 192g which are 787 kcal (1g carbohydrates = 4.1 kcal). This means carbohydrates would make up to **47%** of the total energy intake.

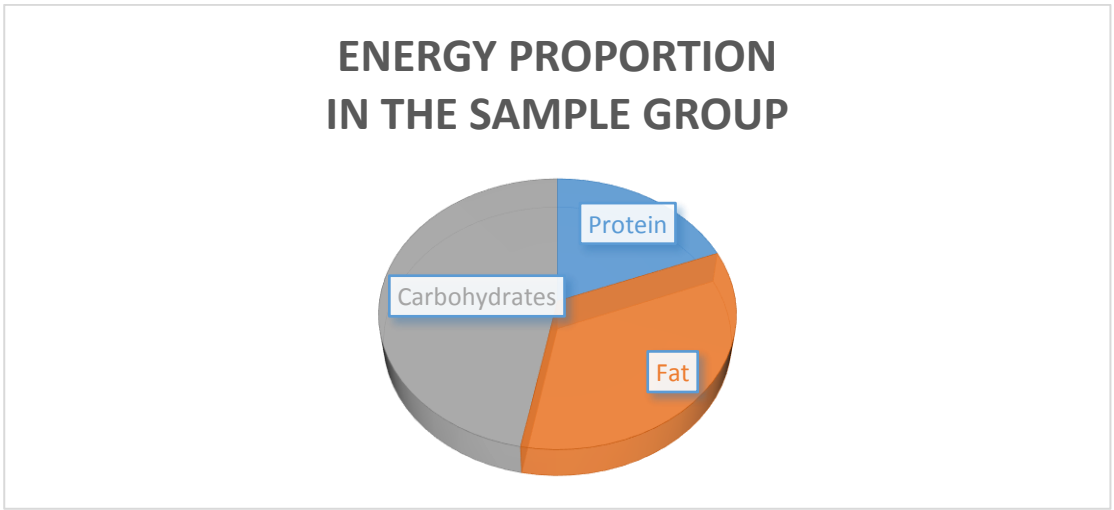


Figure 24: Energy proportion in the sample group

The results showed that the energy intake in the sample group was lower than the reference value for both men and women. However, the distribution of the main nutrients for energy delivery varied from the guidelines. The proportion of protein with 19% and fat with 34% of the total energy intake in the diet of the sample group were both higher than the recommended percentage of total energy intake. And the percentage of carbohydrates was with 47% of the total energy intake much lower than the recommended intake.

To sum it up, the Vietnamese's energy intake was significantly lower than the reference value. However, the intake of fat and protein were among Vietnamese men and women much higher compared to the recommended intakes. The Vietnamese also did not meet the reference values for carbohydrates for nutrient uptake from D-A-CH 2015. An improvement of the energy proportion in the Vietnamese diet is here very desirable.

4.5.3 Essential fatty acids

	WOMEN	D-A-CH 2015		MEN
		w	m	
Linoleic acid[9] (g)	7*	5	6.3	6.9
α-Linolenic acid[10] (g)	1.2	1	1.3	1.3
EPA (mg)	237.9	-		176.8
DHA (mg)	345.1	-		279.9
EPA + DHA (mg)	583*	250		456.8*

EPA=eicosapentaenoic acid, DHA=docosahexaenoic acid

Table 2: The daily intake of essential fatty acids among Vietnamese

4.5.3.1 Linoleic acid

The daily intake of linoleic acid among Vietnamese men with 6.9g met the reference value of 2.5% of the total energy intake. For Vietnamese women the linoleic acid intake of 7g per day was actually significantly higher than the recommended intake. But in

[9] Intake of linoleic acid should account for 2.5% of total energy of an adult
[10] Intake of α-linolenic acid should account for 0.5% of total energy of an adult

comparison, the male and female linoleic acid intakes were not significantly different from each other.

4.5.3.2 Alpha-Linolenic acid

The α-linolenic acid intakes of the Vietnamese men and women met the recommended value of 0.5% of the total energy intake. The men had an intake of 1.3g/day. The women had an α-linolenic acid intake of 1.2g/day which was higher than the reference intake. However, the result had no significant evidence.

4.5.3.3 EPA + DHA

The Vietnamese had a quite high intake of eicosapentaenoic acid and docosahexaenoic acid. The reference value of EPA + DHA is at 250mg per day for men and women. Both, the men with an intake of 456.7mg/day and the women with 583mg/day had a significant higher intake in comparison with the recommended intake. The two groups compared had no significant gender differences in the intake.

4.5.4 Lipo-soluble vitamins

	WOMEN	D-A-CH 2015		MEN
		w	m	
Vitamin A retinol equivalents[11] (mg)	1.4	0.8	1	1.1
β-carotene (mg)	3.2	2 - 4		2.5
Vitamin D calciferol (µg)	2.2*	20		1.6*
Vitamin E tocopherol equivalents[12] (mg)	19.2*	12	14	16.9
Vitamin K phyllochinon[13] (µg)	134.7*	60	70	87.8

Table 3: The daily intake of lipo-soluble vitamins among Vietnamese

[11] 1mg retinol equivalent= 1mg retinol= 6mg all-trans-β-carotene= 12mg other provitamin-A-carotenoids= 1,15mg all-trans-retinyl acetate= 1,83mg all-trans-retinyl palmitate

[12] 1mg RRR-α-tocopherol equivalent= 1mg RRR-α-tocopherol= 1,1mg RRR-α-tocopheryl acetate= 2mg RRR-β-tocopherol= 4mg RRR-γ-tocopherol= 100mg RRR-δ-tocopherol= 3,3mg RRR-α-tocotrienol= 1,49mg all-rac-α-tocopheryl acetate; Reference value for 25 to under 51 years old were used

[13] Reference value for 19 to under 51 years old were used

4.5.4.1 Vitamin A (Retinol)

Vietnamese men and women met the reference intake of vitamin A retinol equivalents. The women had a higher intake with 1.4mg/day than the men with 1.1mg/day. However, the difference was not statistically significant.

4.5.4.2 Beta-carotene

Both, male and female Vietnamese had an adequate β-carotene intake which was in the reference area of 2-4mg per day. The intakes of the men and women in comparison had no significant difference.

4.5.4.3 Vitamin D (Calciferol)

The Vietnamese had a vitamin D intake of 2µg per day, which is far below the recommended intake of 20µg vitamin D per day. *The vitamin D intake of an adult with common food add up to 2-4µg vitamin D per day, which is not enough for adequate nutritional requirement. The supply should be ensured additional to the dietary intake with endogen synthesis and/or with dietary supplements* (Anon 2015). Furthermore, there were no significant gender differences in the intake of vitamin D among Vietnamese people.

4.5.4.4 Vitamin E (Tocopherol)

The daily intake of vitamin E tocopherol equivalents among Vietnamese men was adequate compared to the reference value. Vietnamese women with a vitamin E intake of 19.2mg per day had a significant higher intake compared to the recommended intake of 12mg per day. However, the intakes of vitamin E among the males and females were not significantly different.

4.5.4.5 Vitamin K (Phyllochinon)

The vitamin K intake was for both sexes above the references values for daily intake. But the intake of vitamin K among female Vietnamese was with 134.7µg/day even more than double as high as the reference value with 60µg/day. For the vitamin K intake there is no defined upper limit therefore it can be assumed that the intake of vitamin K among Vietnamese was satisfying. However, there was no significant difference in the vitamin K intake between the men and the women.

4.5.5 Water-soluble vitamins

	WOMEN	D-A-CH 2015		MEN
		w	m	
Vitamin B1 thiamin[14] (mg)	1.1	1	1.2	1.5
Vitamin B2 riboflavin[15] (mg)	1.1	1.1	1.4	1.3
Vitamin B3 niacin equivalents[16] (mg)	42.6*	12	15	60*
Vitamin B5 pantothenic acid (mg)	3.8*	6		5
Vitamin B6 pyridoxine[17] (mg)	1.5	1.2	1.5	1.8
Vitamin B7 biotin (µg)	46	30 - 60		51.3
Vitamin B9 folate equivalents[18] (µg)	215.5*	300		196.1*
Vitamin B12 cobalamin (µg)	5.5*	3		4.5*
Vitamin C ascorbic acid (mg)	99.2	95	110	113.4

Table 4: The daily intake of water-soluble vitamins among Vietnamese

4.5.5.1 Vitamin B1 (Thiamin)

The daily intake of vitamin B1 among the Vietnamese was above the reference value. There was also no significant difference in the intake of vitamin B1 between the Vietnamese men and women.

4.5.5.2 Vitamin B2 (Riboflavin)

The vitamin B2 intake of Vietnamese people was also satisfying. Vietnamese men have a lower intake of vitamin B2 than the reference intake, but the result was not significant.

[14] Reference value for 25 to under 65 years old were used
[15] Reference value for 19 to under 51 years old were used
[16] 1mg niacin equivalent= 1mg niacin= 60mg tryptophan; Reference value for 25 to under 51 years old were used
[17] Reference value for 19 to under 65 years old were used
[18] 1µg folate equivalent= 1µg natural food folate= 0,5µg synthetic folic acid (pteroylmonoglutamic acid)

There were as well no significant gender differences in the intake of vitamin B2 among the Vietnamese.

4.5.5.3 Vitamin B3 (Niacin)

The daily intake of vitamin B3 niacin equivalents was for male and female Vietnamese significantly higher than the recommended intake. The men had a niacin intake of 60mg per day and the women of 42.6mg per day. *The EFSA (European Food Safety Authority) has defined a tolerable total intake of vitamin B3. Niacin exists in vegetables as nicotinic acid and in animal products as nicotinamide. For nicotinic acid the tolerate amount is 10mg/day and for nicotinamide it is 900mg/day. The main providers of vitamin B3 niacin are meat, coffee and bread* (Anon 2015). The high intake of protein could be one reason for the high intake of niacin among Vietnamese. However, the niacin intakes of the Vietnamese men and women were not significantly different.

4.5.5.4 Vitamin B5 (Pantothenic acid)

The recommended intake of vitamin B5 is for men and women 6mg per day. The vitamin B5 intake was for male and female Vietnamese lower compared to the reference value. The Vietnamese women had with an intake of 3.8mg/day even a significantly lower intake than the recommended 6mg/day. Men and women in comparison had no significant difference in the intake of pantothenic acids.

4.5.5.5 Vitamin B6 (Pyridoxine)

Both Vietnamese men and women had an adequate intake of vitamin B6. There was also no significant difference in the vitamin B6 intake between the male and female Vietnamese.

4.5.5.6 Vitamin B7 (Biotin)

The daily intake of biotin was among Vietnamese men and women in the reference area of 30-60µg per day. The men with a biotin intake of 51.3µg/day and women with 46µg/day were not significantly different in the intake of biotin.

4.5.5.7 Vitamin B9 (Folate)

The reference value for the intake of folate equivalents is 300µg per day. The intake of folate equivalents was for both male and female Vietnamese significantly lower than the

reference intake. The men had an intake of 196.1µg per day and the women of 215.5µg per day. *Studies showed that with a daily intake of approximately 200µg folate equivalents an adequate nutritional requirement of folate can be achieved for an adult. The recommended folate intake of 300µg per day includes already a safety margin* (Anon 2015).

4.5.5.8 Vitamin B12 (Cobalamin)

The intake of vitamin B12 for Vietnamese men with 4.5µg/day and Vietnamese women with 5.5µg/day was significantly higher compared to the reference value of 3µg per day for an adult. *With the common diet of European people the intake of vitamin B12 is far above the reference intake* (Anon 2015). However, there was no significant difference in the vitamin B12 intake between the Vietnamese men and women.

4.5.5.9 Vitamin C (Ascorbic acid)

The intake of vitamin C among Vietnamese was satisfying. The males and females had both a vitamin C intake above the reference value. Therefore, an adequate nutritional supply could be assured. The intakes of Vietnamese men and women in comparison were not significantly different from each other.

4.5.6 Mineral nutrients

	WOMEN	D-A-CH 2015		MEN
		w	m	
Calcium (mg)	525*	1000		533.3*
Potassium (mg)	2256.2*	2000		2306.7*
Magnesium[19] (mg)	247.7*	300	350	279.6*
Iron[20] (mg)	9.5*	15	10	10.5
Zinc (mg)	9*	7	10	11.1
Iodine[21] (µg)	106.6*	200		89.3*

Table 5: The daily intake of mineral nutrients among Vietnamese

[19] Reference value for 25 to 65 years and older were used
[20] Reference value for 19 to under 51 years old were used
[21] Reference value for 19 to under 51 years old were used

4.5.6.1 Calcium

The daily intake of calcium among Vietnamese was significantly lower than the recommended intake of 1000mg per day for men and women. The men had a calcium intake of 533.3mg/day and the women of 525mg/day. *Since our bones store calcium in case of a nutritional under-supply it can be released into our blood stream to maintain a normal calcium concentration in serum. In case of long-lasting nutritional under-supply the situation becomes more critical because this can lead to bone mass reduction* (Anon 2015).

4.5.6.2 Potassium

The Vietnamese had a potassium intake above the reference value of 2000mg per day. Both the male and female Vietnamese had an intake which was significantly higher compared to the reference intake. *A high intake of potassium is effective for lowering the blood pressure* (Anon 2015).

4.5.6.3 Magnesium

Both Vietnamese men and women did not meet the reference value for magnesium. The men with an intake of magnesium of 279.6mg/day and the women of 247.7mg/day were both significantly lower than the recommended intake of 350mg/day for men and 300mg/day for women. Furthermore, there was no significant difference in the magnesium intake between the male and female Vietnamese.

4.5.6.4 Iron

Vietnamese men had an adequate intake of iron, which is above the reference value. For Vietnamese women the situation was more critical. The iron intake among the females with 9.5mg per day was significantly lower than the recommended intake of 15mg per day.

4.5.6.5 Zinc

The Vietnamese had an adequate intake of zinc. The women had a zinc intake of 9mg per day which was even significantly higher in comparison with the reference value of 7mg per day. Although the men had a higher intake of zinc compared to the women, the result was not statistically significant.

4.5.6.6 *Iodine*

The daily intake of iodine among Vietnamese was significantly lower than the reference value of 200µg per day. The intake among the men was only 89.3µg/day and among the women 106.6µg/day. In Austria the iodine intake is linked with the salt intake. One reason for the low intake of iodine among Vietnamese could be the missing entries of salt in the interviews. The author did not always included salt as an ingredient.

4.5.6.7 *Cooking salt - Sodium chloride*

The reference value for salt is maximum 6g per day which also ensures an adequate sodium supply. A higher intake of salt is associated with negative effects (Anon 2015). The daily intake of salt among the Vietnamese was 4.7g per day which was significantly lower compared to the reference intake of 6g per day. Again, one reason for that could be the missing entries of salt. Furthermore, there was no significant difference in the salt intake between Vietnamese men and women.

4.6 Austrian diet vs. Vietnamese diet

In the next chapter the data from the study is been compared to the latest Nutritional Survey of Austria in 2012. For better comparison only one age group (25 to 50 years old) from the Austrian Nutritional Survey has been taken into consideration (Elmadfa 2012).

4.6.1 Energy percentage of main nutrients and alcohol

	Austrian	Vietnamese	D-A-CH 2015
Protein (E%)	15	19	10-15
Fat (E%)	36	34	< 30
Carbohydrates (E%)	46	47	> 50
Alcohol (E%)	3	-	-

E%=percentage of energy

Table 6: Intake of main nutrients and alcohol in energy percentages among Austrian and Vietnamese

The intake of protein among Austrians was clearly lower than among Vietnamese people. In return the fat intake of the Austrians was higher than of the Vietnamese. The intakes of carbohydrates were nearly the same.

The Vietnamese had a higher protein intake than the reference intake of D-A-CH 2015. The intakes of fat were for both Austrian and Vietnamese too high, and the carbohydrate intake for both too low compared to the recommended intake.

4.6.2 Lipo-soluble vitamins

4.6.2.1 Women

	Austrian	Vietnamese	D-A-CH 2015
Vitamin A retinol equivalents (mg)	1.3	1.4	0.8
β-carotene (mg)	3.4	3.2	2 - 4
Vitamin D calciferol (µg)	2.8	2.2	20
Vitamin E tocopherol equivalents (mg)	13	19.2	12
Vitamin K phyllochinon (µg)	102	134.7	60

Table 7: Intake of lipo-soluble vitamins among Austrian and Vietnamese women

The intakes of vitamin A and β-carotene between Austrian and Vietnamese women were nearly the same. The Austrian women had a higher intake of vitamin D, in return the vitamin E and vitamin K intakes were clearly lower in comparison with the Vietnamese women.

The intakes of vitamin A, vitamin E and vitamin K for both Austrian and Vietnamese women were above the reference value. The β-carotene intake was in the reference range and the vitamin D intake was far below the recommended intake.

4.6.2.2 Men

	Austrian	Vietnamese	D-A-CH 2015
Vitamin A retinol equivalents (mg)	1	1.1	1
β-carotene (mg)	3.4	2.5	2 - 4
Vitamin D calciferol (µg)	3.6	1.6	20
Vitamin E tocopherol equivalents (mg)	13	16.9	14

Vitamin K phyllochinon (µg)	89	87.8	70

Table 8: Intake of lipo-soluble vitamins among Austrian and Vietnamese men

The intakes of vitamin A and vitamin K were nearly the same between Austrian and Vietnamese men. Whereas the intakes of β-carotene and vitamin D were among Austrian men clearly higher than among Vietnamese men. The intake of vitamin E was, like for women, among Austrian men lower compared to the intake of Vietnamese men. The vitamin E intake of Vietnamese men was far above the reference intake, whereas the intake of Austrian men was below. Both had an intake of vitamin K which was satisfying. The intake of vitamin D was similarly to the women far below the reference value.

4.6.3 Water-soluble vitamins

4.6.3.1 Women

	Austrian	Vietnamese	D-A-CH 2015
Vitamin B1 thiamin (mg)	1.1	1.1	1
Vitamin B2 riboflavin (mg)	1.2	1.1	1.1
Vitamin B3 niacin equivalents (mg)	27	42.6	12
Vitamin B5 pantothenic acid (mg)	4	3.8	6
Vitamin B6 pyridoxine (mg)	1.5	1.5	1.2
Vitamin B7 biotin (µg)	42	46	30 - 60
Vitamin B9 folate equivalents (µg)	216	215.5	300
Vitamin B12 cobalamin (µg)	4	5.5	3
Vitamin C ascorbic acid (mg)	116	99.2	95

Table 9: Intake of water-soluble vitamins among Austrian and Vietnamese women

The intake of niacin was among Austrian women clearly lower than among Vietnamese women. Also the vitamin B12 intake of Austrian women was below the intake of Vietnamese women. Only the intake of vitamin C among Austrian women was higher in

comparison to Vietnamese women.

For both Austrian and Vietnamese women the intakes of niacin, vitamin B12 and vitamin C were above the reference value. Whereas the pantothenate and folate intakes were for both lower than the reference intake. For all the other water-soluble vitamins the recommended intakes were reached among both Austrian and Vietnamese women.

4.6.3.2 Men

	Austrian	Vietnamese	D-A-CH 2015
Vitamin B1 thiamin (mg)	1.2	1.5	1.2
Vitamin B2 riboflavin (mg)	1.4	1.3	1.4
Vitamin B3 niacin equivalents (mg)	35	60	15
Vitamin B5 pantothenic acid (mg)	4.6	5	6
Vitamin B6 pyridoxine (mg)	2	1.8	1.5
Vitamin B7 biotin (µg)	41	51.3	30 - 60
Vitamin B9 folate equivalents (µg)	197	196.1	300
Vitamin B12 cobalamin (µg)	5.3	4.5	3
Vitamin C ascorbic acid (mg)	110	113.4	110

Table 10: Intake of water-soluble vitamins among Austrian and Vietnamese men

The intakes of niacin and biotin of Austrian men were clearly lower than of Vietnamese men. All the other intakes of water-soluble vitamins were among Austrian and Vietnamese men nearly the same.

For both Austrian and Vietnamese men the intakes of niacin and vitamin B12 were above the reference value. The intakes of pantothenate and folate were for both below the recommended intake of D-A-CH. The intakes of the rest of the water-soluble vitamins met the reference values for both Austrian and Vietnamese men.

4.6.4 Mineral nutrients

4.6.4.1 Women

	Austrian	Vietnamese	D-A-CH 2015
Calcium (mg)	838	525	1000
Potassium (mg)	2632	2256.2	2000
Magnesium (mg)	329	247.7	300
Iron (mg)	10.9	9.5	15
Zinc (mg)	9.7	9	7
Iodine (µg)	130	106.6	200

Table 11: Intake of mineral nutrients among Austrian and Vietnamese women

The intakes of all mineral nutrients were for Austrian women higher than for Vietnamese women.

In comparison with the D-A-CH reference values the intakes of calcium, iron and iodine were among both Austrian and Vietnamese women below the reference intake. The intakes of potassium and zinc were for both above the recommended intake. The Austrian women met the reference intake of magnesium, whereas the Vietnamese women had a lower magnesium intake compared to the reference value.

4.6.4.2 Men

	Austrian	Vietnamese	D-A-CH 2015
Calcium (mg)	881	533.3	1000
Potassium (mg)	2768	2306.7	2000
Magnesium (mg)	334	279.6	350
Iron (mg)	11.8	10.5	10
Zinc (mg)	11.4	11.1	10
Iodine (µg)	143	89.3	200

Table 12: Intake of mineral nutrients among Austrian and Vietnamese men

Similar situation in the intake of mineral nutrients among the men as for the women. The mineral nutrients intakes of Austrian men were all-around clearly higher than for Vietnamese men.

Both Austrian and Vietnamese men had lower intakes of calcium and magnesium than the recommended intake. The intakes of potassium, iron and zinc were for both above the reference value of D-A-CH. The iodine intake was among both Austrian and Vietnamese men below the reference value, but the intake of Vietnamese men did not even reach half of the recommended intake.

5 Summary

Considering the results of the conducted study and the literature review, the author of this thesis considered the answers to the four initial research questions of this thesis to be the following:

Research question 1: **How is the nutritional status of the population in Vietnam?**

The latest General Nutrition Survey of Vietnam from 2009-2010 showed that the nutritional status of children under five years old is still very critical. In 2010, 17.5% of the children under 5 were underweight, 29.3% were stunted and 7.1% were wasted. Critical regions with the highest prevalence were the Northern Midlands and Mountain areas, the North Central area and the Central Coastal area, and the Central Highlands. The lowest levels were found in the Red River Delta and the South East areas. Risk factors which have shown a strong association to these diseases were poor household wealth, rural households, low maternal height, low maternal BMI, low maternal education and low household dietary diversity. From 2000 to 2010, the prevalence of underweight and stunting had significantly decreased. However, there was no significant evidence of improvement for the prevalence of wasting in children under 5 years. The prevalence of wasting in Vietnam is considered at medium level by the World Health Organization. While the prevalence of undernutrition is decreasing, overweight and obesity has become more and more a national concern in Vietnam. The prevalence of overweight and obesity in children under 5 was found at 5.6%. In urban areas the prevalence of overweight/obesity was even higher at 6.5%.

The nutritional status of children 5 to 19 years old in Vietnam is not better. The prevalence of underweight in children 5-19 years old was at 24.2%, the prevalence of stunting was at 23.4% and the prevalence of wasting was at 16.8%. The prevalence of underweight and wasting in children 5-19 years old was even higher than in children under 5. Also the level of overweight and obesity was higher with 8.5%. Risk factors for overweight/obesity were high maternal BMI and high maternal education. The data indicated that in Vietnam in the future the trend of overweight and obese children and adolescents will be increasing especially in large cities.

Chronic energy deficiency is one of the main health problems for adults in Vietnam. In

2010, the prevalence of CED in adults was found at 17.2%. The CED level in women was at 18.5% which was significantly higher than the level for men which was at 15.8%. The highest levels of CED were found in adults under 25 years and over 55 years old. However, comparing the number of CED from 2000 with 2010, it was noted that the CED level decreased in almost all age groups. The prevalence of overweight and obesity in adults in Vietnam was found at 5.6%. The age group from 55 to 59 years old had the highest overweight and obesity level. The region with the highest overweight/obesity level was in the South East. The prevalence there was 10.7%. Overweight and obesity was significantly more prevalent in urban areas than in rural areas.

High focus should also be on the time period of women during pregnancy through the first two years of the child's life because deficiencies during this critical period are leading to lifelong damages of the child. In 2010, the prevalence of chronic energy deficiency in mothers with children under 5 years old was found at 20.2%. The highest level of CED was in young mothers aged 15-19 years old. From 2000 to 2010, the prevalence of CED in mothers had decreased slowly with an average reduction rate of 0.65% per year. Among mothers with children under 5 years old the trend of being overweight and obese was as well clearly increasing over the years. Compared to 2000, the prevalence of overweight/obesity in mothers had more than doubled from 3% to 6.4% in 2010.

Over the years there was a primary change in the food consumption of the Vietnamese population which included the increased amount of food from animal sources. These changes were leading further to a change in the dietary compositions of the Vietnamese. The increased consumption of animal protein in the diet was observed. There were significant differences in the consumption of protein between urban and rural regions. Also the daily intake of oil and fat had gradually increased over the past decades. Another remarkable change happened in the dietary energy intake. The proportion of total energy intake had changed from 1985 with 11.2% from protein, 6.2% from fat and 82.6% from carbohydrates to 15.9% from protein, 17.8% from fat and 66.3% from carbohydrates by 2009. The current ratio is considered to be relatively ideal. These

changes in dietary patterns among Vietnamese showed that the food consumption in Vietnam had improved greatly.

Research question 2: **What are the changes in food habits among immigrants?**

When people move to a new country they may underlie the process of dietary acculturation. Dietary acculturation is the process by which members of a migrating group adopt the food choices and eating habits of their new environment. Dietary acculturation can have both positive and negative dietary changes which leads to positive and negative health consequences. Many factors influencing the dietary acculturation which result in many different patterns and habits of food intake. There are socioeconomic, demographic, cultural, psychological and environmental factors. Studies showed that the factors longer residence in the host country, high education and income of the immigrant, employment outside the home result in a higher exposure to the host culture. Also being married, having young children and fluency with the host language play a major role to the great extent of exposure. “Daily life” factors like exposure to a new food supply, unavailability of traditional foods and ingredients, expensive traditional foods and time-consuming preparation of traditional dishes are one of the most common reason for dietary acculturation among immigrants. There are three different ways of dietary acculturation. First is when the immigrant maintains his or her traditional food habits. Secondly the immigrant fully adopts the host environment foods and eating patterns or third, there will be a biculturalism, which is an incorporation of the host foods and eating habits into their own diet while maintaining some traditional dietary practices.

In another model from Koctürk the food is separated in three main groups with different degrees of importance according to their role in a dish and/or meal. There are staple foods which are the principal component of a meal. Staple foods are for example bread, rice or potatoes. The staple food is the most important element in a dish for the survival of a food tradition. After staple foods follow the complements which are one or several items from four food groups. These four food groups are meat/fish/eggs, milk/cheese, vegetables and legumes. While a staple food should not be substitute, complementary foods can be exchanged with other items without ruining the whole food culture. And

last on the third place come the accessory foods. Accessories are foods including fats, herbs and spices, sweets, nuts, fruits and drinks. Accessory foods are at least important and can be substituted according to taste. Changes in food habits start with the accessory foods. This is because they can be exchanged without ruining a whole food tradition. In a diet, the change begins with incorporation of new accessories then further with different complementary foods and finally with the exchange of new staple foods. The attachment of traditional staple foods is the strongest which is why it is the last food item that changes in a diet if it changes at all.

Dietary acculturation in Western countries is associated with negative choices in the dietary pattern like high consumption of fat and sugar, low consumption of fruits and vegetables in the diet, lower physical activity, higher Body Mass Index and bigger portion sizes for examples. Such changes in food habits can lead to an increasing risk of chronic diseases including obesity, hypertension, cardiovascular diseases, type 2 diabetes mellitus, metabolic syndrome, mental diseases and even cancer among immigrants. High attention should be given to immigrant women who had according to several studies adopt several unhealthy food habits to their traditional diet such as high consumption of fat and sugar snacks and drinks, and as well more fast foods. The main reasons of this negative acculturation are different barriers such as high prices of healthy food, easier access to highly produced foods, low nutritional knowledge, unavailability of traditional foods and ingredients, uncertainty towards new foods and as well convenient and affordable fast food in the host country. Female migrants need specific attention due to their reproductive role and as well due to their role in purchasing and preparing the family meals which have a strong impact on the dietary practices and health behavior of the whole family.

Research question 3: **What are the daily intakes of energy and other nutrients look like among Vietnamese living in Austria?**

A study has been conducted to analyze the diet of in Austrian living Vietnamese. 42 subjects (17 male, 25 female) did respectively 2 times a 24h-recall interview. With the nutrition program GloboDiet the interviews were captured and evaluated. Statistical analysis has been made with SPSS Statistics. The results and outcomes were compared

with the recommendation of D-A-CH 2015.

The daily intake of energy in kcal among Vietnamese did not meet the reference values at all. The women with 1515 kcal per day and the men with 1880 kcal per day had respectively a significantly lower intake than the recommended intake. The protein intake was among male and female Vietnamese significantly higher in comparison with the reference intake. Vietnamese men had a protein intake of 90.1g/day. Also the Vietnamese women had a significantly higher intake of protein with 66.1g/day. The intake of protein was among Vietnamese men significantly higher than among the women. That means that the factor gender had significant influence on the intake of protein amongst Vietnamese. The Vietnamese intake of fat met the reference intake. The intake of saturated fatty acids among Vietnamese men was 26.7g/day which was higher than the reference intake. A similar result was shown among Vietnamese women with an intake of 24.1g/day which was as well higher compared to the reference value. However, both results were not statistically significant. The cholesterol intake of Vietnamese men and women were as well for both higher in comparison with the reference value. The Vietnamese men with an intake of 221.9g carbohydrates per day and the women with 171.1g per day were both lower than the reference value for carbohydrate intake. But only the result for the Vietnamese women was significantly lower than the reference intake. The sugar intake of Vietnamese people was for males and females both higher than the recommended intake. Again, only the women had a significantly higher intake than the reference value. Both Vietnamese men and women had a significantly lower intake of dietary fiber compared to the reference value.

The comparison of the dietary energy intake of the Vietnamese sample group with the recommendation of D-A-CH showed that the energy intake among Vietnamese was lower than the reference value for both men and women. However, the distribution of the main nutrients for energy delivery varied from the guidelines. The proportion of protein with 19% and fat with 34% of the total energy intake in the diet of the sample group were both higher than the recommended percentage of total energy intake. And the percentage of carbohydrates was with 47% of the total energy intake much lower than the recommended intake. An improvement of the energy proportion in the

Vietnamese diet is here very desirable.

The daily intakes of lipo-soluble vitamins among Vietnamese men and women were for all vitamins, except for one, above the reference values. Only the vitamin D intake did not meet the reference value. However, the vitamin E and vitamin K intakes among female Vietnamese were significantly higher than the recommended intakes. The Vietnamese had a significantly higher intake of the water-soluble vitamin B3 than the reference value which can be associated with the high intake of protein. Furthermore, the intake of vitamin B5 was quite low amongst Vietnamese. But only the vitamin B5 intake of Vietnamese women was significantly lower. The vitamin B9 intakes were for both male and female Vietnamese significantly lower than the recommended intakes. In return were the intakes of vitamin B12 for both significantly higher.

The daily intakes of mineral nutrients among Vietnamese looked more critical. The intakes of calcium, magnesium and iodine of both Vietnamese men and women were significantly below the reference values. For female Vietnamese the intake of iron was also significantly lower than the reference value. Only the intake of potassium was among male and female Vietnamese significantly above the recommended intake. The Vietnamese women had as well a significantly higher intake of zinc compared to the recommended intake.

Research question 4: **How is the Vietnamese diet in comparison with the Austrian diet?**

The comparison of the diet from in Austria living Vietnamese with the Austrian diet revealed some differences but also many similarities. First, the dietary energy intake. In the Vietnamese diet the protein intake made up a big percentage of the total energy intake. In the Austrian diet the fat intake was more dominant. The carbohydrate intake played for both Vietnamese and Austrians rather an underpart. The intake of lipo-soluble vitamins looked in Vietnamese and Austrian people quiet similar. Vietnamese men and women had a quiet high intake of the water-soluble vitamin B3 which could be explained by the high intake of protein in their diet. Furthermore, Austrian and Vietnamese had both low intakes of vitamin B5 and vitamin B9 compared to the reference value. This is counted for both men and women. The intake of mineral nutrients showed a big difference in the diet of Austrian and Vietnamese people. The

Austrian had for all mineral nutrients a clearly higher intake in comparison with the Vietnamese. This result is counted for men and women. In detail, the intake of calcium was for both Austrian and Vietnamese low, however, the calcium intake of the Vietnamese was much lower. The magnesium intake was also for both low, but for the Austrian it only concerned the men and for the Vietnamese both men and women were affected. In addition, the intake of iron was among Vietnamese and Austrian women below the recommended intakes.

To sum it up, it is hard to say which diet is healthier than the other. Every form of diet has its critical nutrients and risk factors which should be considerate. On the other hand, it is likely the Vietnamese who are living in Austria have already acculturated to the Austrian diet which makes a comparison obsolete.

5.1 Conclusion

The diet of Vietnamese immigrants in Austria is compared to the Vietnamese population in Vietnam much better. Nutritional diseases like underweight, stunting and wasting do not play a role in Austria. In Austria, the main health concerns are the high prevalence of overweight, low physical activity, high consumption of meat and meat products and the high intake of saturated fatty acids, sugar and salt. It is the high energy intake on the one hand and the low physical activity on the other hand what makes this eating behavior more than critical. Observing the food habits of Vietnamese immigrants in Austria, it is noticeable that the Vietnamese immigrants have adopted some eating habits of the Austrian people. There are many similarities between the diets. The diet of Vietnamese immigrants living in Austria is more similar to the Austrian diet compared to the diet of the population in Vietnam. For further results, the diet of Vietnamese immigrants in Austria should be observed on regularly basis to see the development of their food habits and eating patterns, and as well to prevent following health consequences.

6 References

Anon, 2015. *Deutsche Gesellschaft für Ernährung, Österreichische Gesellschaft für Ernährung, Schweizerische Gesellschaft für Ernährung: Referenzwerte für die Nährstoffzufuhr*, Available at: http://www.oege.at/index.php/wissenschaft-forschung/referenzwerte?layout=edit&id=2024 [Accessed May 15, 2016].

Anzenberger, J., Bodenwinkler, A. & Breyer, E., 2015. *Migration und Gesundheit*, Available at: https://media.arbeiterkammer.at/wien/PDF/studien/Bericht_Migration_und_Gesundheit.pdf [Accessed May 13, 2016].

Baldaszti, E. et al., 2015. *Statistisches Jahrbuch 2015: Migration und Integration 2015*, Available at: http://www.integrationsfonds.at/themen/publikationen/zahlen-fakten/statistisches-jahrbuch-2015/ [Accessed May 13, 2016].

Bayanzadeh, M., 2008. *Changes in food habits among Farsi and Dari speaking immigrant women in British Columbia, Canada*. Available at: http://summit.sfu.ca/item/8997 [Accessed May 14, 2016].

Bermúdez, O.I., Falcón, L.M. & Tucker, K.L., 2000. Intake and food sources of macronutrients among older Hispanic adults: association with ethnicity, acculturation, and length of residence in the United States. *Journal of the American Dietetic Association*, 100(6), pp.665–73. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10863569 [Accessed May 14, 2016].

Besharat Pour, M. et al., 2014. Effect of Parental Migration Background on Childhood Nutrition, Physical Activity, and Body Mass Index. *Journal of obesity*, 2014. Available at: http://web.b.ebscohost.com/abstract?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=20900708&AN=100486339&h=G6EJHKC0f9DGxE2GhZ6FXupneb003RVqgHEV8oJzhhyVd0SL+l55/R48fYkeXesIrKiCnMb0PMaTQMjjC4t2aQ==&crl=f&resultNs=AdminWebAuth&resultLocal [Accessed May 14, 2016].

Bundeskanzleramt Österreich, Migration und Integration in Österreich. Available at:

http://www.zukunfteuropa.at/site/7216/default.aspx [Accessed May 13, 2016].

Bundesministerium für Gesundheit, BMG - Die Österreichische Ernährungspyramide. Available at: http://bmg.gv.at/home/Schwerpunkte/Ernaehrung/Empfehlungen/Die_Oesterreichische_Ernaehrungspyramide [Accessed May 13, 2016].

Carlson, E., Kipps, M. & Thomson, J., 1982. An evaluation of a traditional Vietnamese diet in the UK. *Human nutrition. Applied nutrition*, 36(2), pp.107–15. Available at: http://europepmc.org/abstract/med/7107316 [Accessed May 14, 2016].

Chaparro, C., Oot, L. & Sethuraman, K., 2014. *Vietnam Nutrition Profile*, Available at: http://www.fantaproject.org/sites/default/files/download/Vietnam-Nutrition-Profile-Apr2014.pdf [Accessed May 13, 2016].

Elmadfa, I., 2012. *Österreichischer Ernährungsbericht 2012*, Available at: http://www.bmg.gv.at/cms/home/attachments/4/5/3/CH1048/CMS1348749794860/oeb12.pdf [Accessed May 12, 2016].

Gadd, M. et al., 2003. Morbidity in cardiovascular diseases in immigrants in Sweden. *Journal of Internal Medicine*, 254(3), pp.236–243. Available at: http://doi.wiley.com/10.1046/j.1365-2796.2003.01178.x [Accessed May 14, 2016].

Glade, M.J., 1999. Food, nutrition, and the prevention of cancer: a global perspective. American Institute for Cancer Research/World Cancer Research Fund, American Institute for Cancer Research, 1997. *Nutrition (Burbank, Los Angeles County, Calif.)*, 15(6), pp.523–6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10378216 [Accessed January 13, 2016].

Haas, G.M., Parhofer, K.G. & Schwandt, P., 2010. Prevalence of Cardiovascular Disease Risk Factors in Migrants Participating in the PEP Family Heart Study, Nuremberg. *International journal of preventive medicine*, 1(1), pp.19–28. Available at: http://search.proquest.com/openview/47dee94cc0633089b89b34448a1ff5bb/1?pq-origsite=gscholar [Accessed May 14, 2016].

Himmelgreen, D.A. et al., 2004. The longer you stay, the bigger you get: length of time and language use in the U.S. are associated with obesity in Puerto Rican women. *American journal of physical anthropology*, 125(1), pp.90–6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15293335 [Accessed May 14, 2016].

Holmboe-Ottesen, G. & Wandel, M., 2012. Changes in dietary habits after migration and consequences for health: a focus on South Asians in Europe. *Food & nutrition research*, 56. Available at: http://www.foodandnutritionresearch.net/index.php/fnr/article/view/18891/24704 [Accessed May 11, 2016].

Huijts, T. & Kraaykamp, G., 2012. Immigrants' Health in Europe: A Cross-Classified Multilevel Approach to Examine Origin Country, Destination Country, and Community Effects. *International Migration Review*, 46(1), pp.101–137. Available at: http://doi.wiley.com/10.1111/j.1747-7379.2012.00882.x [Accessed May 14, 2016].

De Irala-Estevez, J. et al., 2000. A systematic review of socio-economic differences in food habits in Europe: consumption of fruit and vegetables. *European journal of clinical nutrition*, 54(9), pp.706–714. Available at: https://www.researchgate.net/profile/Miguel_Martinez-Gonzalez/publication/12321732_Irala-Estevez_JD_Groth_M_Johansson_L_Oltersdorf_U_Prattala_R_Martinez-Gonzalez_MA._A_systematic_review_of_socio-economic_differences_in_food_habits_in_Europe_consumption_of [Accessed May 14, 2016].

Koctuerk, T., 2004. Food habit changes in a group of immigrant Iranian women in uppsala family medicine stockholm. *Int Interdisciplinary J*, 3(2), pp.27–33. Available at: https://tspace.library.utoronto.ca/handle/1807/3066 [Accessed May 14, 2016].

Koctuerk, T., 1995. Structure and change in food habits. *Scandinavian Journal of Nutrition*, 39, pp.2–4. Available at: http://agris.fao.org/agris-search/search.do?recordID=SE9511444 [Accessed May 12, 2016].

Lahmann, P.H. et al., 2000. Differences in body fat and central adiposity between Swedes and European immigrants: the Malmö Diet and Cancer Study. *Obesity research*, 8(9), pp.620–31. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11225710 [Accessed May 14, 2016].

Le, T.H. & Le, D.T., 2010. *UNICEF Viet Nam - Resources - General Nutrition Survey 2009 - 2010*, Available at: http://www.unicef.org/vietnam/resources_21138.html [Accessed May 13, 2016].

Lee, S.K., Sobal, J. & Frongillo, E.A., 1999. Acculturation and dietary practices among Korean Americans. *Journal of the American Dietetic Association*, 99(9), pp.1084–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10491677 [Accessed May 14, 2016].

Lerman-Garber, I., Villa, A.R. & Caballero, E., 2004. Diabetes and cardiovascular disease. Is there a true Hispanic paradox? *Revista de investigación clínica; organo del Hospital de Enfermedades de la Nutrición*, 56(3), pp.282–96. Available at: http://europepmc.org/abstract/med/15612509 [Accessed May 14, 2016].

MDG Achievement Fund, 2013. *Integrated Nutrition and Food Security Strategies for Children and Vulnerable Groups in Viet Nam*, Available at: http://www.mdgfund.org/sites/default/files/Vietnam - Nutrition - Final Narrative Report.pdf [Accessed May 13, 2016].

Mellin-Olsen, T. & Wandel, M., 2005. Changes in food habits among Pakistani immigrant women in Oslo, Norway. *Ethnicity & health*, 10(4), pp.311–39. Available at: http://www.tandfonline.com/doi/abs/10.1080/13557850500145238 [Accessed May 14, 2016].

National Institute of Nutrition, VDD - Food-based dietary guidelines - Viet Nam. Available at: http://viendinhduong.vn/news/en/714/123/food-based-dietary-guidelines---viet-nam.aspx [Accessed May 13, 2016].

National Research Council (US) Committee on Diet and Health, 1989. *Diet and Health*, Washington, D.C.: National Academies Press. Available at:

http://www.ncbi.nlm.nih.gov/books/NBK218743/ [Accessed February 25, 2016].

Otero-Sabogal, R. et al., 1995. Dietary practices, alcohol consumption, and smoking behavior: ethnic, sex, and acculturation differences. *Journal of the National Cancer Institute. Monographs*, (18), pp.73–82. Available at: http://www.ncbi.nlm.nih.gov/pubmed/8562225 [Accessed May 10, 2016].

PAN, Y.-L. et al., 1999. Asian Students Change their Eating Patterns After Living in the United States. *Journal of the American Dietetic Association*, 99(1), pp.54–57. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9917732 [Accessed April 25, 2016].

Popovic-Lipovac, A. & Strasser, B., 2013. A review on changes in food habits among immigrant women and implications for health. *Journal of immigrant and minority health / Center for Minority Public Health*, 17(2), pp.582–90. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23892613 [Accessed May 14, 2016].

Raj, S., Ganganna, P. & Bowering, J., 1999. Dietary habits of Asian Indians in relation to length of residence in the United States. *Journal of the American Dietetic Association*, 99(9), pp.1106–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10491683 [Accessed May 14, 2016].

Read, J.G. & Reynolds, M.M., 2012. Gender differences in immigrant health: the case of Mexican and Middle Eastern immigrants. *Journal of health and social behavior*, 53(1), pp.99–123. Available at: http://hsb.sagepub.com/content/53/1/99.short [Accessed May 14, 2016].

Ronellenfitsch, U. & Razum, O., 2004. Deteriorating health satisfaction among immigrants from Eastern Europe to Germany. *International journal for equity in health*, 3(1), p.4. Available at: http://equityhealthj.biomedcentral.com/articles/10.1186/1475-9276-3-4 [Accessed May 14, 2016].

Roshania, R., Narayan, K.M. & Oza-Frank, R., 2008. Age at arrival and risk of obesity among US immigrants. *Obesity (Silver Spring, Md.)*, 16(12), pp.2669–75. Available

at: http://www.ncbi.nlm.nih.gov/pubmed/18846044 [Accessed April 30, 2016].

Satia, J.A. et al., 2001. Development of scales to measure dietary acculturation among Chinese-Americans and Chinese-Canadians. *Journal of the American Dietetic Association*, 101(5), pp.548–53. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11374348 [Accessed April 27, 2016].

Satia, J.A., 2003. Dietary acculturation: definition, process, assessment, and implications. *International Journal of Human Ecology*, 4(1), pp.71–86. Available at: https://scholar.google.at/scholar?cluster=7469217638839258995&hl=de&as_sdt=0,5#0 [Accessed May 14, 2016].

Satia, J.A. et al., 2000. Use of qualitative methods to study diet, acculturation, and health in Chinese-American women. *Journal of the American Dietetic Association*, 100(8), pp.934–40. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10955052 [Accessed May 14, 2016].

SIPCAN „Initiative für ein gesundes Leben“, Medizinische Universität Wien. Available at: https://www.meduniwien.ac.at/homepage/news-und-topstories/?tx_ttnews%5Btt_news%5D=5469&cHash=bca460aeb5a072495d639c6ec7614a4b [Accessed May 13, 2016].

Wiking, E., Johansson, S.-E. & Sundquist, J., 2004. Ethnicity, acculturation, and self reported health. A population based study among immigrants from Poland, Turkey, and Iran in Sweden. *Journal of epidemiology and community health*, 58(7), pp.574–82. Available at: http://jech.bmj.com/content/58/7/574.short [Accessed May 14, 2016].

Winkler, V. et al., 2009. Cancer profile of migrants from the Former Soviet Union in Germany: incidence and mortality. *Cancer causes & control : CCC*, 20(10), pp.1873–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19543985 [Accessed May 14, 2016].

Ziegler, R.G. et al., 1993. Migration patterns and breast cancer risk in Asian-American women. *Journal of the National Cancer Institute*, 85(22), pp.1819–27. Available at:

http://www.ncbi.nlm.nih.gov/pubmed/8230262 [Accessed February 23, 2016].