GÖTEBORGS UNIVERSITET
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Consumption of dietary iron sources among Tajik women

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Sammanfattning

Järnbrist orsakad av anemi är en av de vanligaste sjukdomarna i utvecklingsländer. Anemi påverkar arbetsförmågan och är därmed ett hinder för utveckling både för individer och för länder. I Tadzjikistan antas mer än 40 % av alla kvinnor lida av denna sjukdom, som i många fall går att förebygga med en väl sammansatt kost. Syftet med denna studie var att beskriva kostintaget bland en grupp kvinnor i norra Tadzjikistan med särskilt fokus på källor till järn i maten.

Den metod som användes var 24-timmars intervjuer (24-hour recall) med 50 kvinnor där de fick berätta om vad de ätit och druckit dagen innan intervjun.

Resultatet visar att kosten är ganska homogen. Några av källorna till järn är kött, baljväxter och bröd. Nära 70 % hade ätit kött någon gång under dagen, men vanligen endast i mängder på omkring 60 g. Baljväxter hade ätits av nästan 50 % med ett genomsnittligt intag på 40 g. Nästan alla hade ätit bröd under dagen. Det genomsnittliga intaget låg på omkring 300 g. Te var mycket vanligt som dryck till maten, vilket troligen har en hämmande effekt på absorptionen av järn. C-vitamin, som kan främja upptaget av järn konsumerades i liten utsträckning, och kött, som också har denna funktion åts vanligen i små mängder.

Slutsaten är att det fanns ett antal goda källor till järn i kosten, men att dessa livsmedel endast åts i små mängder. Livsmedel som har en hämmande effekt på järnabsorption var vanligt förekommande, och livsmedel som ökar järnupptaget var sällsynta.

Keywords: Dietary sources of iron, food patterns, Tajikistan, 24-hour recall

Contents

Preface

First of all I want to thank SIDA for the MFS-scholarship that made this project possible.

Second, I want to thank Operation Mercy and especially the staff in the HINT project for asking me to be a part of the team for a while. Special thanks to Bodil Lind and Gulizor Dustova for helping with translation, and for all the support.

Also, I want to thank all the women who were willing to answer questions about their food intake and my mentor, Christina Berg, who has been very supportive and encouraging.

Finally, I want to thank my family and friends for encouraging me to go through with my dreams. You are great!

The opportunity of living and working in a different culture has been of great value to me. I have learnt a lot of things that I think will be valuable to me in the future, both as a food service manager and privately. One of the most important things, which I have learnt is that knowledge is a privilege.

Introduction

According to WHO (2011) anaemia caused by iron deficiency is one of the most common nutritional disorders in the world. The health consequences when suffering from iron deficiency anaemia (IDA) can differ, but some of them are headaches, exhaustion and difficulties to breathe (Provan, 2009). WHO claims that

> Iron deficiency and anaemia reduce the work capacity of individuals and entire populations, bringing serious economic consequences and obstacles to national development. Overall, it is the most vulnerable, the poorest and the least educated who are disproportionately affected by iron deficiency, and it is they who stand to gain the most by its reduction. (WHO, 2011).

To prevent iron deficiency anaemia it is important to have a diet, which contains enough amounts of iron. If there is an already existing anaemia, iron supplements are usually necessary to get the iron levels up to normal (Provan, 2009). IDA can also be caused by illnesses and hook worms.

An investigation done between 1993 and 2005 shows that the prevalence of IDA in women in Tajikistan is severe (≥ 40%) (Benoist, McLean, Egll, & Cogswell, 2008).

This project describes and analyses the meal patterns of a specific group of people with a special focus on a health problem (i.e. IDA), which can be prevented with a good diet. Very few similar investigations have been carried out in Central Asia, and as far as known none in Tajikistan, which makes the project especially interesting from a research perspective.

For a food service manager, knowledge about meal patterns and how food is put together is essential. For most nutrients the intake over a period of time is what matters (Nordic Council of Ministers, 2004). However, when it comes to iron, the composition of meals, the combination of different foods and the way in which the food is prepared is vital for the absorption.

Aim

The aim of this essay is to describe the dietary intake among a group of women over 18 years old in Northern Tajikistan and to analyze food choices and meal compositions with specific attention to iron intake and absorption.

Issues

From the perspective of the women: What does this group of women report that they eat? How are the meals composed?

From a health/nutrition perspective: How is the food intake composed in relation to iron absorption?

Background

Earlier research

There are few similar studies carried out concerning food patterns in Central Asia. The few studies that exist mainly concern iron status in different groups of people.

One of these studies was carried out in Kazakhstan in the Kzyl-Orda region in 1994-1995 (Dangour, Hill, & Ismail, 2001). In total, 3 625 non-pregnant women between 18 and 45 years old were surveyed, and the results showed that 40.2 % of these women were anemic (Hb < 12 g/ dl). To find out what aspects might be correlated to haemoglobin concentration, the participants were asked questions about socioeconomic, reproductive and dietary issues. The authors found a negative correlation to the amount of tea drunk; high amounts of tea were correlated to lower haemoglobin concentration (p= 0,004). There was a positive correlation to crop score and high possession score; those who planted two or more different crops or owned more than a certain number of items (i. e. refrigerator, car, bicycle, radio, television etc.) were more likely to have a higher haemoglobin concentration (p < 0,001).

Another study from Kazakhstan in 1999-2000 indicates that availability of different products may have a significant influence on public health, since people cannot buy and eat products if they are not available (Yim, Humphries, & Abuova, 2003). The more easily available products were usually imperishable products like cookies, juice, sugar, coffee, tea and alcohol, i.e. products which are not beneficiary for a healthy lifestyle. Perishable products like vegetables, fruit and meat were less available. The study also includes a comparison of availability and consumption. Consumption of products was based on a nutritional survey carried out in 1996 by the Kazak National Institute of Nutrition (Abuova, 1996). The following items were items that people consumed twice a week or more in the winter months: coffee, tea, bread, potatoes, cooking oil, meat, pasta, butter, carrot, cabbage, milk, egg, kefir, candy, flour, kolbasa (a kind of sausage), nuts, fruit juice, beans, tomatoes, bananas, fish, melons and kumis (horse milk). The study included 458 participants from Almaty, the city where Yim, Humphries & Abuova´s (2003) study was carried out.

Country information

The following information about Tajikistan is taken from Encyclopaedia Britannica. (Tajikistan, 2011)

Population:	About 7 million people 2010
Ethnic groups:	Tajiks, Uzbeks, Russians et al
Total area:	143 100 square kilometers
Capital:	Dushanbe
Language:	Tajik. Russian is also widely spoken (not an official language)

Tajikistan is the smallest of the five countries of central Asia. There are lots of high mountains in the country, the highest 7,495 meters high. However, most people live in the valleys, which make up just about one tenth of the country´s area. Tajikistan is a dry country with a soil rich in minerals and poor in humus. The climate in the valleys is continental with

hot and dry summers with temperatures around 30˚C, and winters with a temperature around 0˚C.

The Tajik people origin from Iranian peoples. They did not have their own state until 1929, when it was included as a part of the Soviet Union. The country became independent in 1991 after the disintegration of the Soviet Union. Shortly after the independence, civil war broke out and went on until 1997.The civil war killed thousands of people and severely damaged the economy. At present, Tajikistan is a republic with two legislative houses.

Agriculture is an important part of the Tajik economy. Cotton is the most important crop, but cultivation of fruit, grains and vegetables are also important for the country, as well as rising of livestock. The use of chemical fertilizers and pesticides has caused environmental damage and health problems in the area. All farming is dependent on irrigation.

Operation Mercy and HINT

Operation Mercy is a relief and development organization working internationally with community development and humanitarian aid projects (Operation Mercy, 2012). One of the countries they work with is Tajikistan, where there are lots of different projects going on. One of these is HINT, Health Initiative Northern Tajikistan.

> In partnership with government and health professionals, the Health Initiative for Northern Tajikistan (HINT) project raises awareness of general health, disease prevention, and healthy lifestyles among villagers of the Sughd Region/Khujand. The team's health lessons empower people to improve their health and support medical institutions' disease prevention efforts. (Operation Mercy, 2012)

One part of the health lessons concerns food and healthy eating. To be able to improve the teaching and adapt it to the present conditions, there was a request for a nutritional survey to be done.

Food patterns

There are many different factors impacting the way people eat. Two very obvious factors are the need to eat and the desire for well-being, but there are many more (Barasi, 2003). Cultural issues, economic circumstances, environmental factors, religious prescriptions and availability all make their contribution to creating food patterns (Barasi, 2003, Eastwood, 1997). However, there is a pattern for food, which most cultures follow (Barasi, 2003). It can be illustrated as a triangle divided into three parts as in figure 1. Core foods consist of carbohydrates and are the most important part of meals. If this part is excluded there will be no meal. Secondary food is food, which is needed for growth and for a good health, including meat, egg, milk, fish, fruit, vegetables and pulses.

Figure 1 Food pattern triangle

Peripheral foods mainly contain sugar and fat, and are not essential but tasty and pleasant to eat. The

essential nutrients come from the core and the secondary foods, but usually there is a greater emphasis on core foods in poorer countries.

Iron availability and absorption

Iron absorption is dependent on many different factors. Not all iron in the food is available for absorption (Eastwood, 1997). There are two different types of iron in food, haeme iron (comes from animal foods) and non-haeme iron (in fruits, vegetables and pulses). These two different types are absorbed in different parts of the body and have a different availability. Haeme iron is absorbed in the intestines and has an availability of around 25 %. Non-haeme iron is absorbed in the gut lumen and has a lower availability, which is influenced by a couple of different factors. According to many sources (Food and Agriculture Organization; World Health Organiztion, 2001, Nordic Council of Ministers, 2004 and Eastwood, 1997 to mention a few) the composition of a meal is vital for the absorption of non-haeme iron. Polyphenols, phytates and calcium seem to have a reducing effect on the absorption. Ascorbic acid (vitamin C) and an unknown factor in meat, fish and poultry (MFP-factor) have an enhancing effect. According to the Nordic Council of Ministers (2004) the enhancing factors can counteract the effect of the inhibiting factors to some extent. The amount to which they can do this has been discussed.

In a study about iron absorption in young Indian women, Thankachan et al (2008) showed that tea reduces the absorption of iron severely both in persons with IDA and in those with normal iron stores (between 49 and 67 % decreased absorption), and that ascorbic acid has a substantially enhancing effect on absorption (more than 200 % increased absorption). According to this study, for people with normal iron stores it seems like one cup of tea will have a significantly smaller inhibiting effect of iron absorption in one meal than two cups. For people with IDA, however, there is no significant difference in inhibiting effect from one cup of tea compared with two cups. The enhancing effect of ascorbic acid did not seem to have the same amount-related effect. This study only concerned the iron absorption from a single meal, and similar results have been obtained in other single-meal studies (Nordic Council of Ministers, 2004). In other studies where whole diets have been studied, the effect of enhancing and inhibiting factors have also been seen, but not to the same extent. Some studies have shown that ascorbic acid does not have a long-term effect on iron absorption. However, "despite varying results from studies on whole diets, subjects with poor iron status seem to benefit from a diet rich in factors enhancing iron absorption." (Nordic Council of Ministers, 2004, p. 358)

The level of iron in the body influences absorption. Absorption is increased during pregnancy, menstruation and if a person suffers from iron deficiency; if the iron stores are low or empty, the body absorbs more than when they are full. According to Thankachan et al (2008), the biggest difference in absorption between different persons is connected to different iron store levels.

The recommended intake of iron for women in childbearing age is 19,6 mg/day if the bioavailability is 15 % (Food and Agriculture Organization; World Health Organization, 2001). The median requirement at 15 % availability is 9,7 mg/day. If the availability is lower,

the intake needs to be higher. It is also recommended that women in childbearing age avoid or limit their intake of inhibiting factors, and that they increase their intake of vitamin C with the main meals (if the meal contains iron).

Sources of iron

Haem iron is found in meat, fish and poultry (Nordic Council of Ministers, 2004). Non-haeme iron can be found in a variety of fruits and vegetables, but mainly in green leafy vegetables, pulses and eggs.

Inhibitors and enhancers

There are three substances that are supposed to inhibit iron absorption; phytates, polyphenols and calcium (Nordic Council of Ministers, 2004). Phytates and polyphenols only inhibits non-haeme iron, but calcium inhibits both non-haeme and haeme iron. Phytates can be found in unprocessed fibre-rich products and cocoa, polyphenols are mainly found in tea, coffee and cocoa, and calcium is found primarily in dairy products.

Ascorbic acid and the unknown factor in meat, fish and poultry (MFP-factor) have been shown to have an enhancing impact on iron absorption (Nordic Council of Ministers, 2004). Ascorbic acid is found in fresh fruits, berries and vegetables rich in vitamin C, i.e. lemon, oranges, pepper, some juices etc. The MFP-factor is found in fish, meat and poultry.

Method

Design

A survey of 50 women between 20 and 53 years old in the city of Khujand and nearby villages in Northern Tajikistan, conducted from March to April 2012. The women were asked what they had eaten the day before the interview. Information on how to do 24-hour recalls was taken from Callmer, Hagman, Haraldsdottir, Bjørge Løken, Seppänen, & Trygg (1986) and Gibson & Ferguson (1999).

Sample

The investigated population was women over 18 years old. There were three reasons for limiting the investigation to women:

- Iron deficiency anaemia is most common among women
- Culturally, it was easier and more correct for the author as a woman to interview other women. Also, most of the existing contacts in the HINT project were with women.
- Women are the ones who cook, and are more likely to be aware of amounts and contents of the food.

The intention was to interview women in different villages and in the city to get a picture of the general diet, and not just the diet in one place. To find women who were willing to participate in the interviews, Operation Mercy´s contacts in the villages and in the city were used. The optimal way to pick out a sample would have been to do a stratified random sample

(Bryman & Nilsson, 2011). However, the time and limitations of this study did not admit this. The goal was to do about the same number of interviews in all the different places. In the end, there were more interviews done in some of the places than in others. The reason for this was that it was not possible to know in beforehand how many women would come to the lessons held by Operation Mercy. Those who came were asked if they wanted to participate and almost everybody who was asked was willing to do so. Two or three did not want or did not have time to participate. There were five villages where there was a possibility to carry out the investigation. All the villages were in the northern part of the country, close to a town called Khujand, and they all had a population, which was mainly Uzbek. Most of the households in these villages had a cow, hen and sheep. The five villages are Novobod (6 interviews, 1 occasion), Kyoktol (10 interviews, 2 occasions), Oktosh (8 interviews, 1 occasion), Otchbuch (9 interviews, 1 occasion) and Shorbolo (6 interviews, 1 occasion). Also, 11 interviews were done at seven different occasions in the city Khujand. In the city, personal contacts were used to find women who were willing to participate.

Most of the interviews were carried out in groups since people seemed to be more comfortable to be interviewed in front of the small group rather than sitting alone with the interviewer and interpreter.

Dietary assessment method

The strategy used was doing face-to-face surveys in the form of 24-hour recalls. A 24-hour recall is a quantitative method with the purpose to find out what a person has eaten and drunk during the last 24 hours, and the answers are obtained by interviews (Abrahamsson, Andersson, Becker & Nilsson, 2006). Since the interviewer and the respondents had different mother tongues interpreters were used. The interviews were carried out in English or Swedish and then translated to Tajik or Uzbek, and the answers were translated back to English or Swedish. The interviews were usually carried out in connection to health lessons held by Operation Mercy. The women were asked to describe how the food was cooked – how much of each ingredient was used, and then how many persons it was cooked for. The amount of each ingredient was then divided by the number of people who had eaten the food to get approximate amounts for one portion. The amounts were estimated by the women by telling how many piolas (a small bowl which is used to drink from), bowls or spoons they had used of a certain food. In some cases they could tell how many grams of something they had used for the food, and sometimes they showed with their hands how big the pieces of for example bread or meat were, and the weight was estimated on this basis. Everything was written down on paper, and later transcribed to an Excel file.

Data analyses

The data was analyzed by making a list of all the food that the respondents had eaten for each meal. The list of foods was sorted by the total number of people who had eaten a certain food, starting with the most frequent food. Every village/town was shown separately as well (see appendix 1).

The average consumption in grams of foods that have an impact on iron absorption was calculated.

To show the meal composition, the meals were divided according to types of meal: bread meal, egg meal, fried food, soup, osh, mantu, others and "did not eat". The percentage of the sample who had had each different type of meal was shown in a pie chart. Each meal was then described with the interviews as a base.

To show the different foods in the diet, all items were categorized into groups; milk, kefir, yoghurt and cream were categorized as dairy, potatoes, carrots and onions as root vegetables etc. The percentage of the sample who had eaten something from each food group was shown in a bar chart.

Finally, good sources of iron and inhibiting and enhancing factors for iron absorption were shown in a table with the percentage of the sample having had each particular food. To distinguish good sources of iron, foods that on average were eaten in amounts enough to contribute with more than 0,5 mg iron/portion were taken into account.

Ethical considerations

To ensure personal integrity, all information obtained has been handled confidentially. Each person was asked for their first name and their age, which was written down on the answer sheet together with the date and place of the interview. The sheets were then numbered according to the order in which the interviews were carried out, and when transcribed to the computer the names were left out. The reason for including the names in the first stage was to show respect for people and acknowledge them as individuals and also to make it possible to keep people apart.

Most of the interviews in this investigation were done in front of a small group. The risk with doing interviews in front of groups is that people might feel ashamed for telling about personal things in front of others. The reason for doing the interviews in groups was that people seemed to be more comfortable that way and not ashamed. According to (Gibson & Ferguson, 1999) it is important when doing interviews like this to adopt to what people feel comfortable with.

Participation in interviews was voluntary, and all participants were informed of the aim of the study.

Methodological considerations

There are other methods, which could have been used. A food frequency questionnaire is a questionnaire where there are lots of different foods and products written down, and the respondent is supposed to fill in how often they eat different things (Barasi, 2003). This method is easily analyzed with a scoring system and is good for ranking people within a group. However, the method requires a very good knowledge of what is eaten in the addressed culture, so as to be able to make a relevant questionnaire. The knowledge of what is commonly eaten was too limited, and therefore this method was not used.

Another possible method could have been to ask people to keep a food diary. According to people with good knowledge of the country it would not work, as people out of politeness are likely to write what they think they should have eaten rather than what they actually ate,

which will make the result irrelevant. Also, a food diary requires a lot from the respondents and the level of reading comprehension was unknown. Because of these objections, this method was excluded.

Result

The interviews were made in March and April 2012 and spread out over the days of the week according to table 1. The number of people interviewed on each occasion varied between one and nine.

Table 1 Distribution of days of intake

Day	Number of interviews
Monday	10
Tuesday	8
Wednesday	9
Thursday	8
Friday	1
Saturday	1
Sunday	11

Food patterns

Black tea and bread is present at almost every meal. On average, those who drank black tea (78 %) had 7 piolas a day (about 1 liter). The median amount is 5,25 piolas (about 0,8 liters). Some of these persons also had green tea or coffee to drink during the day. In one of the villages, Novobod, green tea was consistently more common than in the other places.

The mean consumption of bread is 5, 29 pieces (about 300 g) per day. The measures are very rough, 1 piece was usually described as one "halfhand". One bread would be about 7 pieces. The bread is made of white flour, water, salt, oil and yeast and is quite compact. The average amount of bread contributes with about 3 mg iron/day[1].

Pulses were eaten by 46 %, with an average intake of about 40 g. The most common kind of pulses was mung beans. Chick peas, red beans and white beans were also eaten. The different kinds of pulses contain between 5,5 and 7,7 mg iron/100 g of dried beans (Swedish National Food Agency, 2012).

Meat was eaten by 68 % on the day they were interviewed about. The average amount eaten was between 60 and 70 g. The average consumption of the whole sample (including those who did not eat meat that day) was about 45 g. In this weight, bones and fat might be included. The word "meat" refers to different kinds of meat; beef, chicken, lamb and goat, and to sausage which might contain any of these. The iron contents of the different kinds of meat

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[1] Iron content of the bread estimated to 1 mg/100 g (Swedish National Food Agency, 2012)

are between 1 and 2,4 mg/100 g (Swedish National Food Agency, 2012), but they are all good sources of iron.

Most people seem to follow a similar pattern for their meals. They start the day with breakfast between 7 and 8 a.m. Lunch is eaten between 12 a. m. and 1 p. m., and most people had dinner between 6 and 7 p.m. Lunch and dinner are the two main meals. Usually, a lighter lunch was followed by a more substantial dinner and vice versa. The type of food consumed for the two meals are similar. About 50 percent of the sample had something to eat or drink in-between the meals, in the morning usually around 10.30, in the afternoon around 3.30 and in the evening at some point a few hours after dinner.

In the following description of the result, each meal has been divided into different types of breakfasts, lunches and dinners with the percentage of people who had the different types. The food is categorized in seven categories: Fried food, soup, the national meals osh and mantu, bread meal, "others" (food that did not fit under the four other categories) and "did not eat". Each meal is then analyzed by the kinds of food represented in the sample for that meal, and finally foods rich in iron and foods containing inhibiting and enhancing factors for iron absorption are presented. For a more precise description of what people had to eat, see appendix 1, Result from 24-hour-recalls.

Breakfasts
Most people (70 %) had a meal mainly consisting of bread for breakfast (see figure 2). The bread was usually eaten with butter or a dairy product, and tea was commonly drunk with the meal. More than 20 % had some kind of cooked food for breakfast; eggs, fried food, or leftovers of soup and osh (the dishes are described in detail under "*Lunch*"). A few of these contained meat or pulses, and bread was usually included in this meal as well.
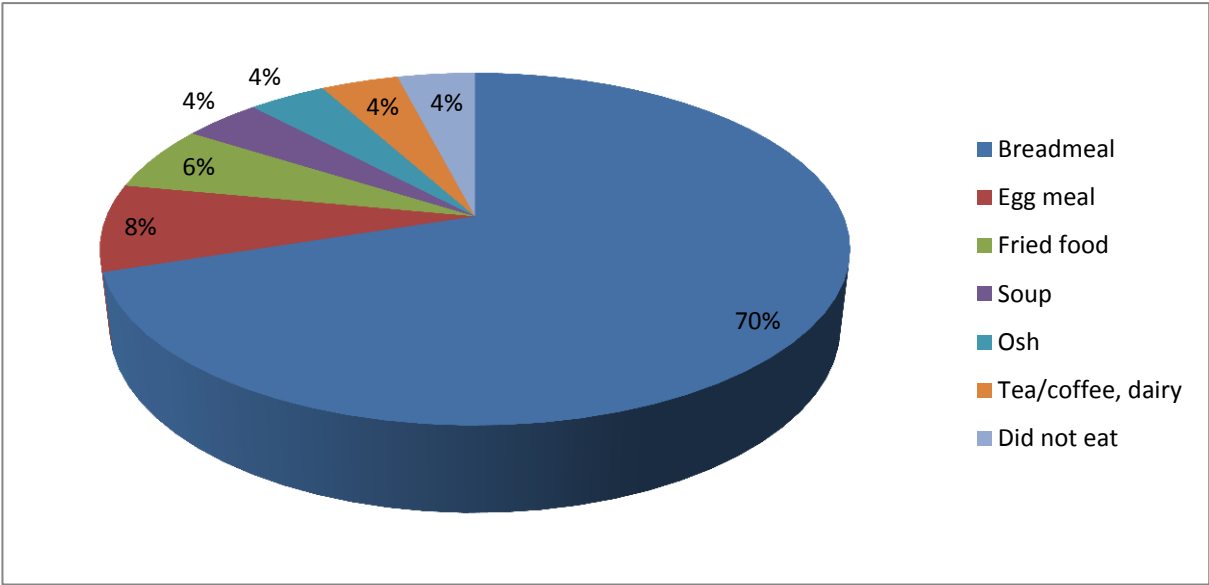
Figure 2 Types of breakfasts. Intake reported by women in Tajikistan (n=50).

A variety of different foods were represented in the breakfasts (see figure 3). Of the 96 % who had breakfast, almost all had bread and a little less than half had butter on their bread. Most people (n=30) had black tea to drink; some had water, green tea, coffee or juice. More than 60

% had eaten something sweet with their breakfast, i.e. sugar in their tea or cookies. Fat (butter or oil) was present in more than 50 % of the meals, and dairy products (yoghurt, milk or cream) in 29%. A few had had leftovers and eggs.

Figure 3 Breakfast intake reported by Tajik women. Percentage of the population who included different categories of foods in their breakfasts (n=48).

Foods that might be good sources of iron in the breakfasts were egg, meat and pulses, none of which more than 8 % had eaten (table 2). Bread is also a source of iron, and almost everybody had eaten it for breakfast. The main inhibiting factor was tea/coffee, which was drunk by 83 %, followed by dairy products. Very few enhancing factors were found in the breakfasts; a few people had had juice or meat.

Table 2. Sources of iron, inhibiting factors and enhancing factors in breakfast intake reported by Tajik women. Percentage of population who included different foods in their breakfast.

Iron-rich sources		Inhibiting factors		Enhancing factors	
Product	*%*	*Product*	*%*	*Product*	*%*
Egg	8 %	Tea/coffee	83 %	Juice	4 %
Meat	4-8 %	Dairy	29 %	Meat	4-8 %
Pulses	2-6%				
Bread	94%				

Lunch
A variety of different meals were eaten for lunch, and they were divided into five different categories:

Soup is a very common dish. Onion, potatoes, carrots, oil and mung beans make up the base for most soups. Either one or more of the following foods were also added: meat (beef, lamb, chicken or sausage), other kinds of beans and vegetables, rice and spices. Most people ate

bread with the soup, and some also added yoghurt. Black tea was the most common drink, but some people had water or green tea.

The most common dish to eat for lunch was **fried food**. Oil, potatoes, onions and eggs were the most common ingredients, and some had other vegetables, meat or spice as well. Almost everybody had bread with the fried food and a few had yoghurt or salad. Black tea was most common to drink with the meal.

The national food in Tajikistan is **osh**. According to some of the interviewed women, most people eat osh at least twice a week, on Wednesdays and Sundays. To make osh, chopped onion, thin julienne carrots and a piece of meat (usually beef, but lamb and goat meat also occur) are fried in a large amount of oil (cotton or vegetable). Some people also add chick peas. When these ingredients are thoroughly fried, rice is added and enough water to cover the rice. Salt and sometimes spices are added. The food is then boiled for about an hour, often in an iron pot. When the rice is ready, everything is mixed and put on a big plate from which everybody eats. The meat is cut in smaller pieces and put on top, in the spring time sometimes together with minced meat cooked in parcels made of fresh vine leafs. Some people ate some kind of salad with the osh, others had bread or yoghurt. Most people drank black tea with the meal.

Bread meals usually consisted of bread and butter or some kind of dairy product.

Among the **other** meals, onion, oil, carrots, potatoes and rice were the most common ingredients. Most people had bread and black tea with their meal.

The most common thing to eat for lunch was fried food, followed by "others" and soup (figure 4).
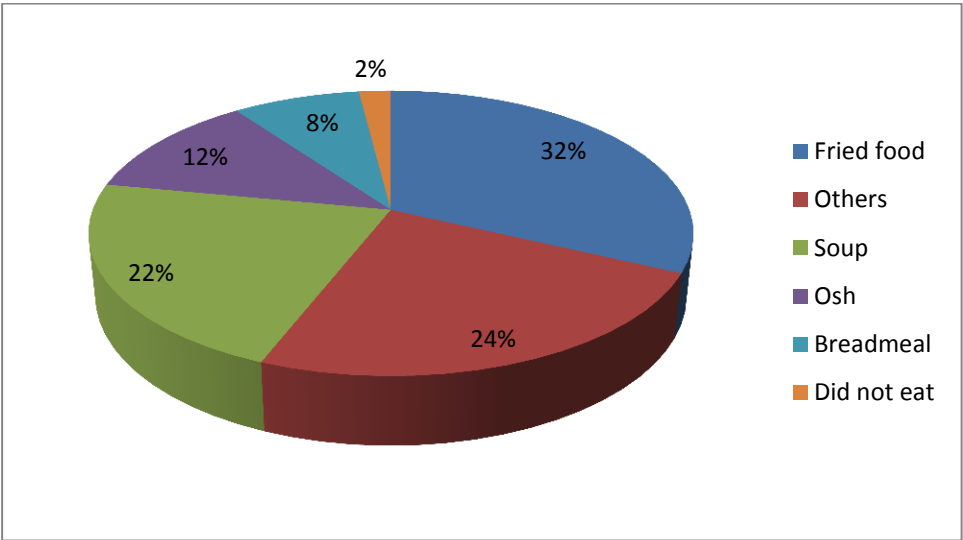
Figure 4. Types of lunches. Intake reported by women in Tajikistan (n=50).

Almost all respondents had lunch. The four most common foods were bread, tea/coffee, root vegetables, and fat (mostly oil) (figure 5). About 30 percent had some kind of meat or pulses

to eat with their lunch, and rice, water, eggs and dairy products were present in around 20 %. Sweets, vegetables, herbs and pasta were eaten by less than 20 %.
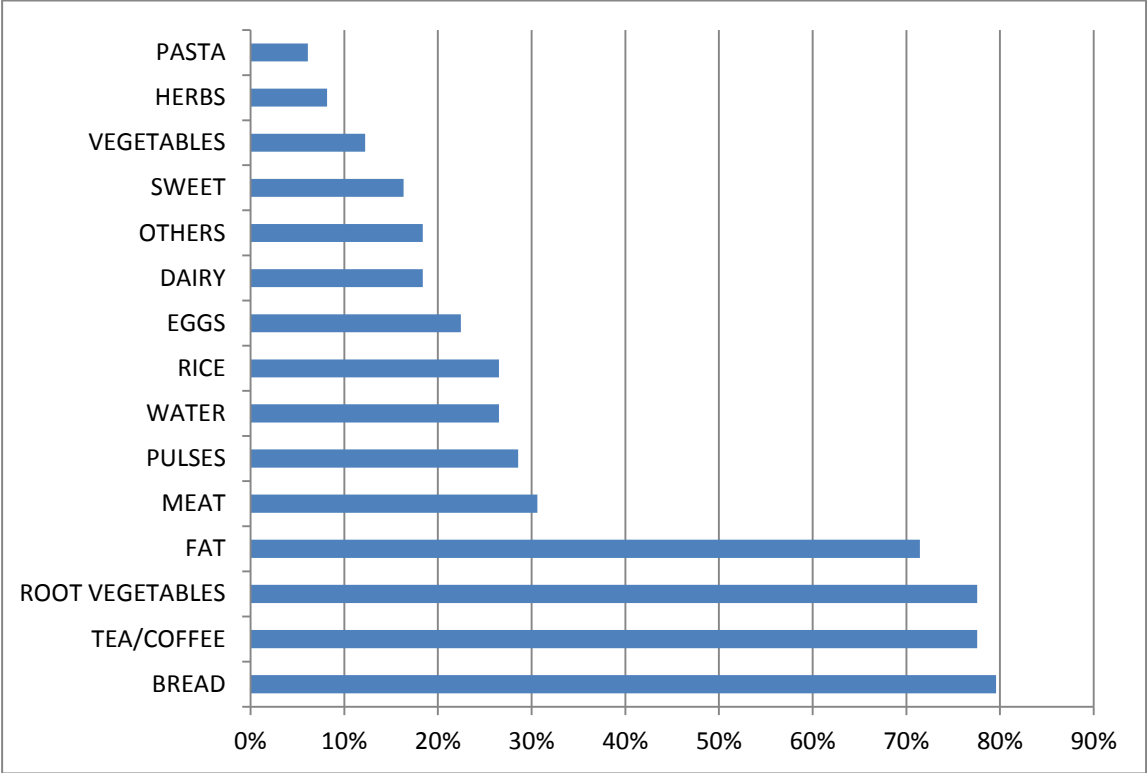
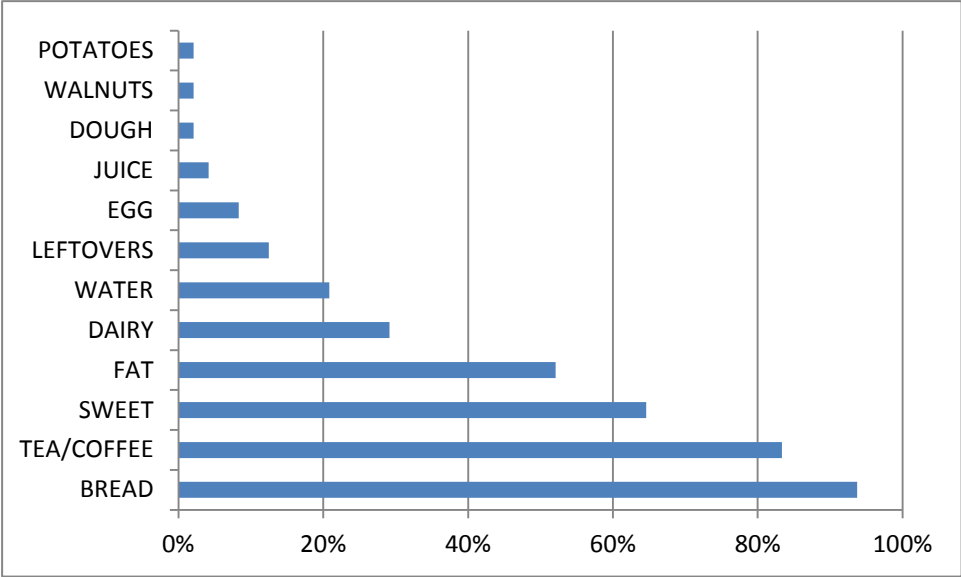*Figure 5.* Lunch intake reported by Tajik women. Percentage of the population who included different categories of foods in their lunches (n=48).

Good sources of iron in the lunches were meat, pulses, eggs, pasta and bread (table 3). The inhibiting factors were tea/coffee and dairy products, and the enhancing factors were meat and vegetables.

Table 3. Sources of iron, inhibiting factors and enhancing factors in lunch intake reported by Tajik women. Percentage of population who included different foods in their lunch.

Iron-rich sources		Inhibiting factors		Enhancing factors	
Product	*%*	*Product*	*%*	*Product*	*%*
Meat	31 %	Tea/coffee	83 %	Meat	31 %
Pulses	29 %	Dairy	29 %	Vitamin C[2]	20 %
Egg	22 %				
Pasta	6 %				
Bread	80%				

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[2] Vitamin C from one or more of the following raw vegetables: Tomatoes (20 mg/100 g), cucumber (9 mg /100 g), green onion (41 mg/100 g), onion (6 mg/100 g), radish (33 mg/100 g), cabbage(5 mg/100 g) and carrots (6 mg/100 g) (Swedish National Food Agency, 2012)

Dinner

As can be seen in figure 6, the most common dish eaten for dinner was soup. 20 % had osh, and a few had mantu, fried food or bread meal. 2 % did not eat dinner at all, and the remaining 24 % had "others".

Mantu is a dish, which is similar to the Italian ravioli or the Russian pilmeny. To make mantu, pasta dough is made of water, salt and flour, rolled very thin and cut in small pieces. Onion, fat (oil or sheep fat) and some kind of meat are put on the piece of pasta, and the pasta is folded and the edges pressed together. The mantu is then boiled in water.

See description of the other meals under "*Lunch*".
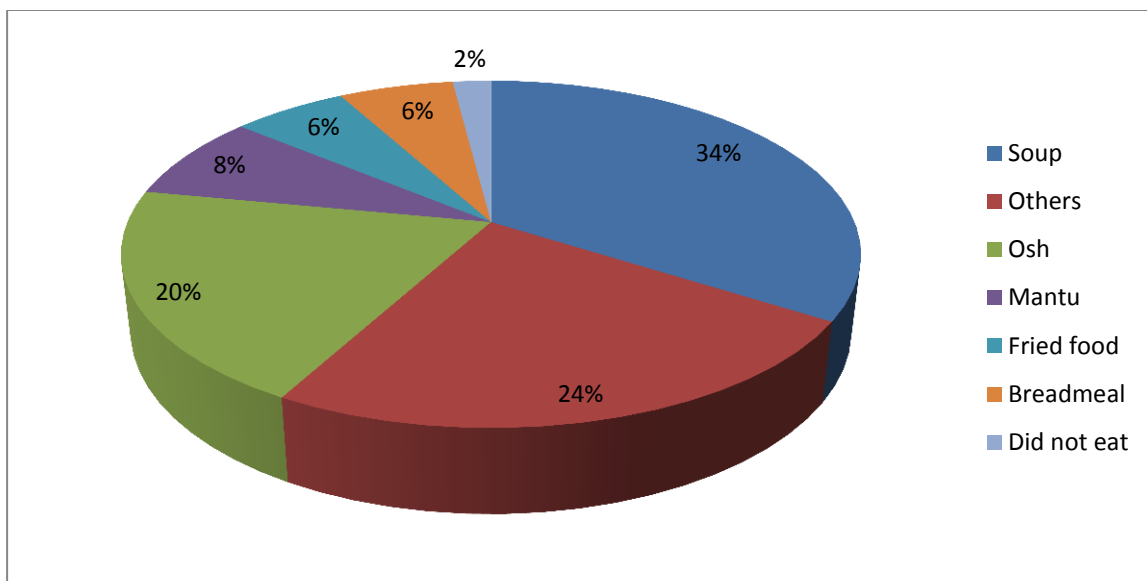
Figure 6. Types of dinners. Intake reported by women in Tajikistan (n=50).

Of the investigated sample, 96 % had dinner. Figure 7 shows that the four most common foods in the dinners were root vegetables, tea/coffee, fat (mainly oil) and bread. Meat and rice was eaten by about 50 %, and pulses by 35 %. Water, pasta and dairy products were present in around 20 % of the meals, and sweets, vegetables, herbs and eggs in less than 10 % of them.
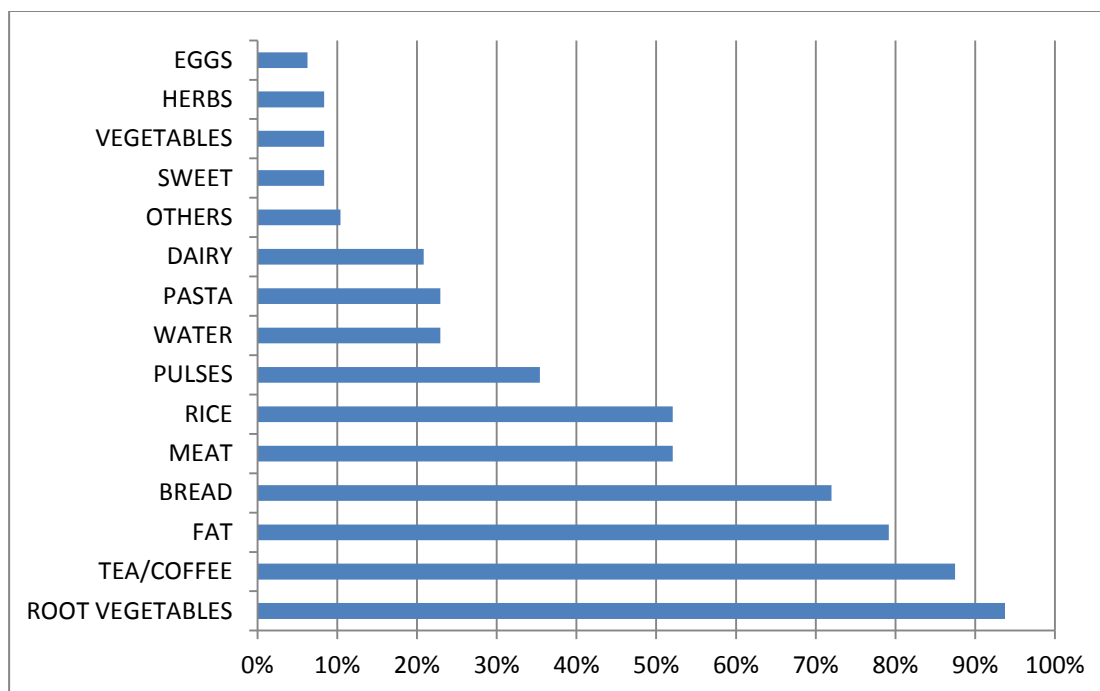
Figure 7. Dinner intake reported by Tajik women. Percentage of the population who included different categories of foods in their dinners (n=48).

Meat, pulses, egg and pasta were important sources of iron also in the dinners (table 4). There is a difference, however, compared to lunch, since more than 50 % had meat. The inhibiting factors are tea/ coffee and dairy, and are about as commonly drunk or eaten as in breakfasts and lunches. The enhancing factors are meat and vegetables.

Table 4. Sources of iron, inhibiting factors and enhancing factors in dinner intake reported by Tajik women. Percentage of population who included different foods in their dinner.

Iron-rich sources		Inhibiting factors		Enhancing factors	
Product	*%*	*Product*	*%*	*Product*	*%*
Meat	52 %	Tea/coffee	88 %	Meat	52 %
Pulses	35 %	Dairy	21 %	Vitamin C[3]	10 %
Eggs	6 %				
Pasta	23 %				
Bread	72 %				

Between meals

About 50 % had something to eat between the main meals, in the morning, afternoon or in the late evening. Those who had something to eat or drink between the meals usually had black

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[3] Vitamin C from one or more of the following raw vegetables: Tomatoes (20 mg/100 g), cucumber (9 mg /100 g), green onion (41 mg/100 g), onion (6 mg/100 g), radish (33 mg/100 g), cabbage(5 mg/100 g) and carrots (6 mg/100 g) (Swedish National Food Agency, 2012)

tea, water or green tea to drink. The most common thing to eat was bread with butter or something else spread on top. Some people had fruit, nuts or something sweet.

In these meals there are no really good sources of iron. Inhibiting factors are tea/coffee and dairy products. A few people ate something containing enhancing factors; apples and juice.

Discussion

Method discussion

There are both advantages and disadvantages with the 24-hour-recall method. The advantage is that it requires very little from the respondent in terms of time and effort (Abrahamsson, Andersson, Becker, & Nilsson, 2006). A method requiring more time and effort from the participants would have been more difficult to carry out, and the number of interviews would have been lower. Another advantage of the method is that the interviews are simple and straightforward, which was helpful since different cultures and languages were involved.

The disadvantage is that it takes a lot of time to collect all the data, and there is a risk of not getting relevant answers (Abrahamsson et al, 2006). It is possible that people don't remember correctly, or for some reason do not want to tell the truth about what they have eaten (Eastwood, 1997). According to Barasi (2003) people´s answers might be influenced by what they think they should eat, either because it is part of their culture or because they perceive that the interviewer has a certain expectation. Since the author is just briefly familiar with the culture and does not speak the language, it is hard to judge the cultural influence on the answers. Just the fact that an interpreter was needed for the communication increases the risk that questions, answers and information might not have been correctly understood. On the other hand, the questions were very simple. These issues are difficult to do anything about within the limitations of this study, but are important to be aware of. Also, it is common that people have a problem with estimating amounts correctly (Eastwood, 1997). For this study, amounts were not as important as what people had eaten, but still some considerations of amounts have been done. More exact estimations could have been achieved if the interviews had been done in the homes of the respondents so that they could show the utensils used for cooking, or if models or pictures of food had been used (Callmer et al, 1986). On the other hand, this would have required more time and resources, and since exact amounts were not crucial for the investigation, the decision was made to just do rough estimations.

Normally, 24-hour recalls are done with one respondent at a time. Most of the interviews in this investigation were done in front of a small group because people seemed to be more comfortable that way. According to Gibson & Ferguson, 1999 it is important when doing interviews like this to adopt to what people feel comfortable with. If people were ashamed of what they had eaten, being interviewed in front of the group might have caused them not to tell about everything thy had eaten, or to say that they had eaten more or less than they actually had. However, the interviewer did not sense any signals that people felt ashamed, and this was also confirmed by the interpreter. On the contrary, they seemed to enjoy the interviews.The variation in answers indicates that people did not adjust their answers because

of the group. Nonetheless, it can not be ruled out that being interviewed in front of a group had an impact on the answers.

The interviews were not evenly spread out over the week, which might also affect the result (Callmer et al, 1986). If people eat differently depending on the day of the week, an uneven distribution of interviews over the week can create a pattern, which is not fully representative. As mentioned in the result, some women said that osh was commonly eaten on Wednesdays and Sundays. If that is true, the fact that more interviews were carried out about Wednesdays and Sundays than about Fridays and Saturdays, for example, makes it possible that the frequency of Osh meals might be misleading.

The time of the year on which the interviews are carried out also have an impact on the results (Callmer et al, 1986). This investigation took place in March and April. If the same investigation would be carried out in the middle of the winter or summer, the results would probably be different, since availability of different foods changes over the year. To get a truly reliable picture of what people are eating over a period of time, it is necessary to do investigations like this spread out over the whole year. Nonetheless, this investigation gives an apprehension of what people eat and where the main sources of iron in the food are.

Finally, the sample was not selected according to a statistically significant method; because of the circumstances the interviews were simply made with people who were available and willing to participate. In a more extensive study a specific scientific sampling technique would make a generalization more legitimate.

Result discussion

The results from this study agree with the study done in Almaty, Kazakhstan in 1996 (Abuova, 1996). One part of the study showed which items people consumed more than twice a week, and most of these items were common also in this investigation. This indicates that the results from this investigation might be representative for more than just the group of people who were interviewed. The women in the sample follow a similar food pattern. The four most common foods in both lunches and dinners were root vegetables, tea/coffee, bread and fat with more than 70 % of the sample eating foods from these categories.

Since there are very few studies about food, food patterns and nutrition carried out in Central Asia, this study is unique and contributing with new knowledge.

There are three main points in the result:

1. The result shows that the sources of iron in the diet were meat, pulses, egg, pasta and bread. The most common of these were meat, pulses and bread. Because of the higher availability of the haem iron, meat must be considered to be the richest source of iron (Eastwood, 1997). However, the amounts of meat eaten are small, between 45 and 70 g depending on how the average is counted. Pulses were eaten by 46 % of the sample with an average amount of 40 g. Pulses contain more than 5 mg iron/ 100 g, and are therefore good sources of iron (Swedish National Food Agency, 2012). Bread was eaten by almost everybody with an average intake

of about 300 g. Because of the high amount of bread eaten, it must be considered as contributing to the iron intake although the content of iron only is about 1 mg/100 g.

A person who ate the average amounts of both meat, pulses and bread would have an iron intake between 5,5 mg[4] and 8 mg[5]. Adding some egg and pasta might add a little more. Considering that most people did not eat *all* the sources of iron and that the average requirement (15 % availability) is 9,7 mg/day (Food and Agriculture Organization; World Health Organization, 2001) it is likely that the iron intake in this group of women generally is lower than the average requirement.

2. The result also shows a high consumption of tea/coffee (an average of about 1 liter/day). According to multiple sources, tea or coffee consumption in connection to a meal containing iron severely reduces iron absorption (Nordic Council of Ministers, 2004, Thankachan, Walczyk, Muthayya, Kurpad, & Hurrell, 2008 and Eastwood, 1997). Since about 80 % of the sample drank tea or coffee to all the main meals (breakfast, lunch and dinner) it is reasonable to assume that the iron absorption in most of the respondents is inhibited to some extent. The study by Dangour, Hill and Ismail (2001) also supports this, since it showed a correlation between high consumption of tea and low haemoglobin concentration.

3. The sources of enhancing factors for iron absorption are meat and vitamin C (Food and Agriculture Organization; World Health Organization, 2001, Nordic Council of Ministers, 2004 and Eastwood, 1997). Not everybody had meat to eat on the day they were interviewed about, and those who had usually had small amounts. The only intake of vitamin C was vegetables, fruit and juice, which was only consumed by a small number of people. Thus, the intake of both meat and C-vitamin is low.

Conclusion and implication
The conclusion is that people seem to follow a similar pattern for what they eat. There are a couple of good sources of iron in the diet, but these foods are usually eaten in small amounts. Foods with an inhibiting effect on iron absorption are common, and foods with an enhancing effect on iron absorption are scarce.

The result from this investigation contributes with new knowledge about dietary patterns in Tajikistan. Knowing that the diet is low in iron, high in inhibiting factors and low in enhancing factors, the recommendation is to encourage people to

1. Increase intake of meat, pulses and other sources of iron
2. Avoid consumption of tea and coffee in connection to lunch and dinner
3. Increase intake of fruits and vegetables rich in vitamin C in connection to lunch and dinner

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[4] 70 g meat with an iron content of 1 mg/100 g, 300 g bread with an iron content of 1 mg/100 g and 40 g pulses with an iron content of 5,5 mg/100 g

[5] 70 g meat with an iron content of 2,4 mg/100 g, 300 g bread with an iron content of 1 mg/100 g and 40 g pulses with an iron content of 7,7 mg/100 g

A suggestion for further research is to do a more thorough study over a period of time of the nutritional situation in the area with a bigger and more representative sample, preferably combined with an investigation of haemoglobin status. It could also be interesting to compare results between villages and between city and villages to see if there are differences.

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BREAKFAST

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand		Total	Number	%	
BREAD	10	6	4	7	9	8			44	92%	81-100 %
BLACK TEA	8	3	2	6	6	5			30	63%	61-80 %
SUGAR	3	5	2	5	4	9			28	58%	41-60 %
BUTTER	3	3	2	5	5	4			22	46%	
WATER	2	3		2	2	1			10	21%	
MILK		3	1	3		3			10	21%	
LEFTOVERS	4			1	1				6	13%	
GREEN TEA			3		1	2			6	13%	
YOGHURT	3					1			4	8%	
COFFEE						4			4	8%	
OIL						4			4	8%	
EGG			1			2			3	6%	
CREAM						3			3	6%	
JUICE	2								2	4%	
JAM		1							1	2%	
SWEETS			1						1	2%	
WALNUTS						1			1	2%	
POTATOES						1			1	2%	
SWEET BREAD						1			1	2%	
FLOUR						1			1	2%	
DOUGH						1			1	2%	
Persons who ate this meal	10	6	5	7	9	11			48	96%	
Didn´t eat			1	1					2	4%	
Total nr of interviews	10	6	6	8	9	11			50	100%	

A. M.

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand		Total	Number	%
BLACK TEA	8	2	2		2	2			16	64%
BREAD	7	1			2	3			13	52%
SUGAR	5				1	1			7	28%
BUTTER	5	1							6	24%
GREEN TEA			2		1	1			4	16%
WATER		1			2				3	12%
SWEETS	2					1			3	12%
APPLES	2								2	8%
COOKIES		1				1			2	8%
WALNUTS	1								1	4%
DRY APRICOTS		1							1	4%
BISCUITS			1						1	4%
COFFEE						1			1	4%
EGG						1			1	4%
OIL						1			1	4%
CREAM						1			1	4%
CONDENSED MILK						1			1	4%

81-100 %
61-80 %
41-60 %

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand			Number	%
Persons who ate this meal	8	3	4		5	5			25	50%
Didn´t eat	2	3	2	8	4	6			25	50%
Total nr of interviews	10	6	6	8	9	11			50	100%

LUNCH

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand	Total		Number	%
BREAD	7	6	4	8	8	6			39	80%
OIL	6	4	4	4	8	5			31	63%
ONION	6	3	5	2	7	6			29	59%
BLACK TEA	7	2	2	7	5	7			30	61%
POTATOES	5	4	3	4	7	3			26	53%
CARROTS	4	3	2	1	5	3			18	37%
WATER	3	3	1	1	4	1			13	27%
RICE	1	1	2	2	3	4			13	27%
EGG	3		2	2	2	2			11	22%
MUNG BEANS		2		2	3	2			9	18%
YOGHURT		1		3		2			6	12%
GREEN TEA			4			2			6	12%
BEEF			2			4			6	12%
TOMATO PASTA	2		1			2			5	10%
TOMATO SALAD			3			2			5	10%
BUTTER	1	1	1		1				4	8%
SHEEP MEAT	1	1		1	1				4	8%
SUGAR	1	1	1			1			4	8%
CHICK PEAS		1				3			4	8%
GREENS						4			4	8%
SAUSAGE	1	2							3	6%
WHITE BEANS				3					3	6%
TURNIP	1			1		1			3	6%
CUCUMBER			1			2			3	6%
GARLIC						3			3	6%
VINE LEAF						3			3	6%
COOKIES		1	1						2	4%
RED BEANS		1			1				2	4%

| 81-100 % |
| 61-80 % |
| 41-60% |

							Total	%
DRIED FRUIT				1		1	2	4%
GREEN ONION						2	2	4%
LEMONADE						2	2	4%
RADISH						2	2	4%
SWEETS		1					1	2%
COW STOMACH				1			1	2%
NOODLES						1	1	2%
SMETANA						1	1	2%
COFFEE						1	1	2%
CHICKEN						1	1	2%
DOUGH						1	1	2%
KEFIR						1	1	2%
CAKE						1	1	2%
Persons who ate this meal	9	6	6	8	9	11	49	98%
Didn´t eat	1						1	2%
Total nr of interviews	10	6	6	8	9	11	50	100%

P. M.

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand		Total	Number	%
BLACK TEA	7	1	1	1	3				13	54%
BREAD	6	1	1		3				11	46%
WATER	1	1	1	1	1	2			7	29%
GREEN TEA			2			1			3	13%
BUTTER	2								2	8%
JUICE	2								2	8%
SUGAR	1					1			2	8%
CAKE				1		1			2	8%
APPLES	1								1	4%
APRICOT JAM	1								1	4%
YOGHURT		1							1	4%
CARROT SALAD			1						1	4%
COFFEE						1			1	4%
Persons who ate this meal	8	3	4	2	4	3			24	48%
Didn´t eat	2	3	2	6	5	8			26	52%
Total nr of interviews	10	6	6	8	9	11			50	100%

81-100 %
61-80 %
41-60 %

DINNER

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand		Total	Number	%	
											81-100 %
ONIONS	9	6	5	8	8	8			44	92%	
OIL	8	5	4	7	7	7			38	79%	61-80 %
BREAD	9	6	3	4	7	7			36	75%	41-60 %
BLACK TEA	10	3	2	6	6	6			33	69%	
CARROTS	8	4	4	5	7	3			31	65%	
RICE	7	3	3	3	6	3			25	52%	
POTATOES	6	5	1	4	4	3			23	48%	
BEEF	4		4	2		4			14	29%	
MUNG BEANS	4	3	1	1	2	1			12	25%	
WATER	2	3			2	3			10	21%	
GREEN TEA			4		1	2			7	15%	
DOUGH		1	1	2	1	1			6	13%	
PASTA	2			2		2			6	13%	
YOGHURT	2	1	1	1					5	10%	
CABBAGE	2			1	2				5	10%	
SHEEP MEAT		3			2				5	10%	
TOMATO PASTA	2	1				2			5	10%	
GREEN STUFF				2		2			4	8%	
CHICKEN	1			2					3	6%	
EGG					1	2			3	6%	
RED BEANS	2								2	4%	
TURNIP	1			1					2	4%	
MINT				2					2	4%	
WHITE BEANS				1	1				2	4%	
SAUSAGE		1				1			2	4%	
BUTTER				1		1			2	4%	
SUGAR						2			2	4%	

	1	2	3	4	5	6		Count	%
MEAT BOUILLON	1							1	2%
CHERRY JUICE	1							1	2%
CHICK PEAS	1							1	2%
GOAT MEAT	1							1	2%
FAT		1						1	2%
CONDENSED MILK				1				1	2%
CREAM						1		1	2%
SWEETS						1		1	2%
KEFIR						1		1	2%
BUCK WHEAT						1		1	2%
RADISH						1		1	2%
Persons who ate this meal	10	5	6	8	9	10		48	96%
Didn´t eat		1				1		2	4%
Total nr of interviews	10	6	6	8	9	11		50	100%

EVENING

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand	Total	Number	%
BLACK TEA	4	2	1	2	1	2		12	55%
WATER	1	2	1	2	2			8	36%
BREAD	4			1				5	23%
SUGAR	4							4	18%
BUTTER	1			1				2	9%
APPLES		1	1					2	9%
COOKIES		1				1		2	9%
GREEN TEA			2					2	9%

	Kyoktol	Tchorbolo	Novobod	Oktosh	Otchbuch	Khujand		Number	%
Persons who ate this meal	5	4	4	4	3	2		22	44%
Didn´t eat	5	2	2	4	6	9		28	56%
Total nr of interviews	10	6	6	8	9	11		50	100%

81-100 %
61-80 %
41-60 %