DETERMINANTS OF IRON DEFICIENCY AMONG CHILDREN AND WOMEN IN AFGHANISTAN AND THE CURRENT POLICY/STRATEGY GAP TO ADDRESS IRON DEFICIENCY ANEMIA

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Determinants of iron deficiency among children and women in Afghanistan and the current policy/strategy gap to address iron deficiency anemia.

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

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Declaration:

Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements.

The thesis Stunting and Wasting of Children under five years, and its association with Knowledge, Attitude/Behavior and Practice of Mothers/Caretakers in Afghanistan is my own work.

Signature:……

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Abstract:

Background: Afghanistan is a war torn country with a dismal health indicators. Maternal Mortality Rate (MMR) is 400 per 100.000 and mortality among children under five is 102 per 10.000 populations. Undernutrition contributes to more than 50% of high mortality and morbidity. According to National Nutrition Survey (NNS) 2013, the prevalence of acute and chronic undernutrition is as follows:

Wasting 4% (<-3 SD) and 9.5% (<-2 SD), stunting 40.9% (<-3 SD) and 20.9% (<-2 SD) and underweight are 9.7% (<-3 SD) and 25% (<-2 SD). Undernutrition and micronutrient deficiency goes parallel among children and mothers. NNS 2013 shows, 44.9% children have anemia of which 13.7% is iron deficiency anemia. Similarly, the prevalence of anemia among women of reproductive age is 40.5% of which 13.8% is iron deficiency anemia.

Objective: This study aims to identify determinants of iron deficiency anemia (IDA) among children under five and women of reproductive age (WRA) in Afghanistan, explore the policy and program gaps and provide evidence based recommendation to MoPH to close the gaps.

Methodology: the methodology used in this study is literature review and secondary analysis of data of NNS 2013.

Findings: the secondary analysis of data from NNS 2013 and literature review shows that the main determinants of iron deficiency anemia are low socioeconomic situation, poor food intake, high prevalence of certain diseases such as ARI, diarrhea, worm infestation and malaria and poor responses of health system. Poor socioeconomic status contributes to either inability to purchase nutritious food and/or poor water and sanitation situation.

Disease and undernutrition have a strong relation as they may cause vicious circle of disease and infection in children. In Afghanistan, high prevalence of certain diseases such as ARI and diarrhea among children under five years are another factor contributing to high prevalence of undernutrition. Chronic malnutrition and micronutrient deficiency in particular iron deficiency anemia are attributable to certain diseases such as diarrhea and ARI.

Conclusion: children under five and women of reproductive age (WRA) are the most vulnerable population to diseases in Afghanistan. Policies alone cannot bring changes until they are complete and implemented. Strong advocacy is needed to encourage the Afghan MoPH to formulate, implement and monitor appropriate, evidence-based policies on nutrition.

Key words: Anemia, Iron deficiency Anemia in Afghanistan, Malnutrition, Under-nutrition, macro nutrient deficiency, IYCF, nutrition survey in Afghanistan, KAP of mother in nutrition

Number of words: 12,333

Abbreviations:

1	ANRVA	Afghan National Risk and Vulnerability Assessment
2	ARI	Acute Respiratory Infection
3	BMI	Body Mass Index
4	BPHS	Basic Package of Health Services
5	C-GMP	Community based Growth Monitoring and Promotion
6	CHW	Community Health Workers
7	CI	Confidence Interval
8	CIDA	Canadian International Development Agency
9	CMAM	Community Based Management of Acute Malnutrition
10	CSO	Central Statistic Office
11	DALY	Disability-Adjusted Life Years
12	DD	Diarrheal Diseases
13	DFATD	Department of Foreign Affair-Trade and Development
14	EPHS	Essential Package of Hospital Services
15	FAO	Food and Agriculture Organization
16	FCS	Food Consumption Score
17	FHAG	Family Health Action Group
18	GBV	Gender Based Violence
19	HB	Hemoglobin
20	HFA	Height For Age
21	HHS	Household Hunger Scale
22	HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
23	HMIS	Health Management Information System
24	IDA	Iron Deficiency Anemia
25	IFA	Iron and Folic Acid
26	IMC	International Medical Corps
27	IPD	Inpatients Department
28	IYCF	Infants and Young Child Feeding
29	KAP	Knowledge, Attitude and Practice
30	Kcal	Kilo Calorie
31	KG	Kilo Gram
32	KMU	Kabul Medical University
33	LBW	Low Birth Weight
34	MAM	Moderate Acute Malnutrition
35	MMR	Maternal Mortality Rate

36	MNCH	Maternal, Newborn and Child Health
37	MNPs	Micronutrient Powder
38	MoE	Ministry of Education
39	MoPH	Ministry of Public Health
40	MRRD	Ministry of Rural Rehabilitation and Development
41	MT	Metric Ton
42	MUAC	Mid-Upper Arm Circumference
43	NID	National Immunization Day
44	NNS	National Nutrition Survey
45	OPD	Outpatients Department
46	OTP	Outpatients Therapeutic Program
47	PMS	Peshawar Medical Services
48	RCSI	Reduced Coping Strategy Index
49	RTI	Reproductive Tract Infection
50	RUSF	Ready to Use Supplementary Food
51	RUTF	Ready to Use Therapeutic Food
52	SAM	Severe Acute Malnutrition
53	SC	Stabilization Center
54	SD	Standard Division
55	SFP	Supplementary Feeding Program
56	STI	Sexual Tract Infection
57	TB	Tuberculosis
58	TFU	Therapeutic Feeding Unit
59	UN	United Nation
60	UNICEF	United Nations Children‘s Fund
61	USAID	United State Assistance for International Development
62	VU	Vrije Universiteit
63	WASH	Water Sanitation and Hygiene
64	WB	World Bank
65	WFA	Weight For Height
66	WFH	Weight For Age
67	WFP	World Food Program
68	WHO	World Health Organization
69	WRA	Women of Reproductive Age

Introduction:

I am a medical doctor graduated from Kabul Medical University (KMU) in 1995. From graduation to 2003, I worked in the field of curative medicine in a hospital established for Afghan refugees in Peshawar city, Pakistan, called Peshawar Medical Services (PMS). Besides carrying the responsibilities in the hospital, working in three primary health clinics inside Afghanistan on a rotation basis was part of my job. I realized from my work in the primary health clinics that medicine alone cannot relieve people's suffering so I changed my field of work from curative medicine to public health.

I started my carrier in public health in 2003 with an international organization called International Medical Corps (IMC) as a technical manager in Khost province of Afghanistan. I have worked in several national and international organizations in different positions. During my tenure in public health, I worked in many fields including MNCH, HIV/AIDS and Public health nutrition. I realized that Afghanistan is one of the countries with bleak health indicators. As undernutrition is one of main contributing factors I focused on nutrition of children and women of reproductive age.

Although there has been some improvement in health indicators since 2003, still there is a lot to do. Women of reproductive age and children under five years are at greater risks of mortality as they are more vulnerable to diseases. Maternal and under five mortality rates are respectively 400/100,000 (WHO 2013) and 102 per 1,000 population in Afghanistan.[1] Poor nutrition of children and women contributes more than 50% to these bleak indicators.

The latest National Nutrition Survey (NNS) 2013 shows that more than 40% (40.9%) of children under five suffer from stunting (<-2SD) and 9.5% of them have wasting (<-2SD). The prevalence of severe acute malnutrition among children under five is 4% (-3SD). The prevalence of moderate underweight among the same age group (under five) is 25% (-2SD) and for only severe underweight is 9.7% (-3SD).

Nutritional anemia results from the simple or combined deficiency of nutrients, such as iron, folic acid and vitaminB_{12}. Other types of anemia can be caused by deficiency of pyridoxine, riboflavin and protein. Although various nutrients and cofactors are involved in maintaining the normal

synthesis of hemoglobin, iron deficiency is the most frequent cause of anemia in Afghanistan. The World Health Organization (WHO) defines nutritional anemia as a hemoglobin level below that which is considered normal for age, sex, physiological state, and altitude, without considering the cause of the deficiency.

Table 1: Hemoglobin level to diagnose anemia at sea level (g/l)

Population	Non-anemia	anemia		
		Mild	Moderate	Severe
Children 6-59 months	110 or higher	100-109	70-99	Less than 70
Children 5-11 years	115 or higher	110-114	80-109	Less than 80
Children 12-14 years	120 or higher	110-119	80-109	Less than 80
Non-pregnant women (15 years and above)	120 or higher	110-119	80-109	Less than 80
Pregnant women	110 or higher	100-109	70-99	Less than 70
Man (15 years and above)	130 or higher	110-129	80-109	Less than 80

Sources adapted from reference 18

Undernutrition and micronutrient deficiency go parallel among children and mothers. According to NNS 2013, 44.9% children have anemia of which 13.7% is iron deficiency anemia. Similarly, the prevalence of anemia among women of reproductive age is 40.5% of which 13.8% is iron deficiency anemia. Considering the prevalence of anemia, and the burden of this disease the people are carrying, I have chosen this topic to further study and explore the determinants of iron deficiency anemia. I compare current policy and strategy to address it and the gap between policy/strategy and the current achievement. In my conclusions I provide appropriate recommendations to close the gaps.

In this thesis, I will explore the immediate, intermediate and basic causes of malnutrition and iron deficiency using the UNICEF conceptual framework 1992.

I expect this document to help the MoPH, as a steward of the health sector, and other stakeholders, such as UN agency and national and international organization to review the causes and underlying factors of iron deficiency anemia in the country and to adapt appropriate policies and strategies to ameliorate the problem.

CHAPTER 1: AFGHANISTAN BACKGROUND

In order to explore the determinants of iron deficiency anemia in Afghanistan, this chapter describes the geography, socioeconomic situations, and the health system. According to the UNICEF conceptual framework for undernutrition, these characteristics influence the nutrition status of women and children.

1.1 Geography

Afghanistan is a mountainous country located in the south-west Asia. The ring of Hindu Kush Mountain divides the country into three geographical areas: the central highland, the southern desert and plateau and the northern plain and grassland. The area of the country is 652,500 km^2 of which 12% is arable, 3% is forestland, 46% is pasture and the remaining 39% is of other types. Afghanistan has borders in the east and south east with Pakistan, in the west with Iran, in the north with Tajikistan, Uzbekistan and Turkmenistan and a small border with China in the east. The country has 34 provinces and 362 districts. Each district is divided into villages.[2] (Annex 1)

1.2 socioeconomic situations:

Since the collapse of the Taliban in 2001, the economy of the people has achieved rapid and fragile growth. Its fragile fast growing economy is attributable to international assistance and growing of agriculture and construction sectors.[3] Despite this progress, Afghanistan remains one of the poorest countries in the world. People suffer from poor housing, and shortages of water, electricity, medical care and job opportunities.[4]

The socioeconomic situation has a direct impact on food consumption of population. 36% of people are living under the poverty line. They cannot afford the required calories (2,100 Kcal) and basic non-food needs such as housing, clothing and education. Their low socioeconomic status can lead to undernutrition, micronutrient deficiency, and iron deficiency anemia.

1.2. 1 Population

The population of Afghanistan is estimated to be 26,500,000 of which 51% are male and 49% are female. 75% (19.1 million) live in rural and 23% (5.9 million) in urban areas. The remaining 1.5 million people live as nomads with no exact location (SCO 2011-2012). 46.1% of the Afghan population is under 15 years of age and 3.7% above 65 years. The high dependency ratio

puts a heavy burden on household economy; every 100 people of the productive age (15-19 years of age) have 103 people dependents that are at the age of below 15 or above 65 years[2].

1.2.2 Education:

In general the literacy rate presented by NRVA 2011-12 has been greatly improved since 2001. But still there is a long way ahead to give the opportunity to every child in Afghanistan to be enrolled in school. According to NRVA 2011-2012, the literacy rate among adult (15 years and over) is 31.4%. Youth literacy rate (15-25 years) is 47%. Net attendance ratio in primary education is 56.8%, in the secondary education 32.7% and in the tertiary education is 5.4%. This shows the enrollment in the primary educating is comparatively better but few of them reach to the tertiary education.[5] According to NNS 2013, education level of mothers has direct effect on nutritional status of mother and children.

1.2.3 Food production and consumption

Although agricultural activities are the main livelihood strategies for the Afghan population, the country is not self sufficient to meet the wheat requirement of its population; wheat has to be imported from neighbor countries. Wheat is the main staple food, which constitute 70% of total cereal consumption. Maize, rice and pulses are other cultivated grains after wheat. The country grows vegetables such as okra, cauliflower, tomatoes onion, potatoes and pumpkins. It grows some good quality fruit such as apples, apricots, grapes, pomegranates, watermelons, and melons. Afghan's grapes and apples are highly appreciated by other countries. Dried fruits and nuts such as pistachio, almonds and apricots are significant agricultural exports.[6]

According to Afghan National Risk and Vulnerability Assessment (ANRVA 2007-2008), grain makes the largest share of energy consumption and wheat forms 70% of total cereal consumption. Oil is in the second category of Afghan diet in term of producing energy. 12% of energy is produced by oil as in most parts of the country people use oily food. Sugar is another constituent that is used in larger amounts by Afghan households. Meat/fish, dairy, vegetable and fruit make smaller portions of food consumption. Imbalanced food consumption is perceived to be more prone to developing micronutrient deficiency including iron deficiency anemia.[7] (Annex 3)

1.2.4 Water and Sanitation:

The availability of clean drinking water is very important in human health. Unclean water causes infectious disease and worm infestations among children and adults. In addition, poor accessibility to safe drinking water may affect the education of children and poverty as children are forced to walk long distance to fetch water. When they spend so much time to fetch water, there is no time left to go to school. In Afghanistan, only 27%of people in rural areas have access to clean drinking water and even fewer to safe sanitation (Source: MRRD, Jan. 2010).

1.2.5 Gender Based Violence (GBV):

GBV includes sexual violence and rape, violence related to harmful traditional practices such as killings, child marriages and 'bad', the selling of women and girls to settle disputes. Although men and boys can also be victims of GBV, women are particularly affected.

GBV has many consequences on health ranging from physical, mental to sexual and reproductive health consequences. 1/3 of all women in the world experience sexual violence in their lifetime either from intimate partner or non-intimate partners. In Afghanistan the research shows that more than 80% of women experience at least once and more than 60% multiple domestic violence events in their lifetime.[8]

1.3 Country Health System:

1.3.1 Basic Package of Health Services (BPHS) and Essential Package of Hospital Services (EPHS):

In Afghanistan, more than 30 years conflict and unrest has badly affected all sectors including the health sector. Before the collapse of the Taliban the health system indicators were dismal. After the collapse of the Taliban in 2001, the ministry of public health with the technical and financial support of international society has developed a health package termed (BPHS). The basic health package focuses on priority diseases and provides basic services to meet basic need of the Afghan population. Seven areas have been defined by this package that addresses the most priority disease to the neediest people including: 1) maternal and newborn health care; 2) child health care; 3) public nutrition; 4) control of communicable disease; 5) mental health; 6) disability and; 7) provision of essential drugs.

The (EPHS) followed the BPHS and was developed to focus on quality and accessibility of hospital services. Public nutrition is an important component of the BPHS. Nutrition was confined only to dissemination of nutrition

messages to the community through routine counseling in the health facilities until the second conference on nutrition was held in November 2014; it was agreed that the focus on nutrition will reduce maternal and child mortality with lower cost and greater effect. As a result of this conference,[9] Afghanistan got the attention of the international society and donors and received some funds from USAID, WB and DFATD (previously CIDA) to implement a nutrition program within the current health system and to support the public nutrition component of the BPHS. Micronutrients supplementation is part of nutrition program being provided to pregnant women and children.

According to nutrition cluster bulletin published by UNICEF, 60,243 children (32,567 girls and 27,676 boys) were treated for acute malnutrition in the first quarter of 2015. This is a 95% increase compared to same period in 2014 (30,807 children). This is the result of gradual expansion of nutrition treatment services within the current BPHS in the country since 2014. The cure rate of admitted children was 72%, which is slightly below the Sphere standards (75%). The reason is the high defaulting rate in Moderate Acute Malnutrition (MAM) treatment (27%) due to stock outs. The cure rate for SAM treatment program is 93.4%.[10]

1.3.2 Micronutrients deficiency:

The NNS 2013 revealed that micronutrient deficiencies, particularly anemia and vitamin A deficiency, are severe public health problems in Afghanistan. The prevalence of anemia among women of reproductive age (WRA) (HB<11.7g/dl) is 40.4% and among children 6-59 months is 44.9%. The prevalence of vitamin A deficiency (vit A< 0.70µm/l) among WRA is 11.3% and among children 6-59 months are 50.4%. Iodine deficiency in WRA is 40.8% and children 7-12 years are 29.5%. Zinc deficiency among WRA is 23.4% and children under five are 15.1%. The majority of women of reproductive age (95.5%) and children (81%) were deficient with Vitamin D (<20ng/ml). 67.4% of women suffer from sever Vitamin D deficiency (<7ng/ml) and 64.2% of children shows moderate Vitamin D deficiency (8-20ng/ml).

Given the high prevalence of anemia among children and women, anemia is a severe public health problem in Afghanistan (based on WHO cut off).

Table 2: Prevalence of micronutrient deficiencies of WRA and Children in Afghanistan:

Micronutrients deficiencies	Women of reproductive age %	Children under five %
Anemia (HB<117g/l)	40.4	44.9
Iron deficiency	24	26.1
Iron deficiency anemia	13.8	13.7
Vitamin A (<0,70 µm/l)	11.3	50.4
Iodine	40.8	29.5 (7-12 years)
Zinc	23.4	15.1
Vitamin D moderate (8-20ng/ml)	30.8	64.2
Vitamin D severe (<7ng/ml)	67.4	16.8

Source: NNS 2013

1.3.3 Consequences of iron deficiency anemia

Iron deficiency anemia occurs when the body depletes its iron from the blood concentration and tissue.

Iron is important because it is an important element to make hemoglobin. If the body is deficient with iron it makes less and smaller hemoglobin resulting in reduced capacity to carry oxygen to the body. Low oxygen in the boy causes fatigue, poor concentration and poor working capacity.

Mild iron deficiency anemia may not cause noticeable symptoms. If anemia is severe, symptoms may include[11]:

- Decreased work capacity
- Prematurity and low birth weight (LBW)
- Prenatal mortality
- Maternal mortality

- Child mortality
- Impaired neurocognitive function in children.

Babies and small children with iron deficiency anemia may not grow as expected and may have delays in skills such as walking and talking. Children may be irritable and have a short attention span. These problems usually go away when the deficiency is treated. If it remains untreated, mental and behavior problems may permanently persist.[11]

CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION, OBJECTIVES, METHODOLOGY, AND THE FREMEWORK

2.1 Problem statement:

Maternal and child undernutrition is highly prevalent in low and middle income countries, resulting in substantial increase in mortality, morbidity and overall burden of diseases. Globally, it is estimated that stunting, severe wasting and intrauterine growth retardation was responsible for 2.2 million deaths that constitute 21% of total Disability-Adjusted Life Year (DALY) for children under five years of age.[12]

Micronutrient deficiency is a common feature of undernutrition and iron deficiency is the most common and prevalent micronutrient deficiency among women and children in the developing world. Around 2 billion people (30% of the world population), are anemic and many of their cases are attributable to iron deficiency. Certain diseases such as ARI, diarrhea, TB, Malaria, HIV/AIDS, schistosomiasis and worm infestation exacerbate the prevalence of undernutrition and are particularly important contributing factors in high prevalence of iron deficiency anemia. Iron deficiency and anemia affect the physical growth and intellectual capacity of children and reduce the work capacity of individuals and entire populations, which will bring serious economic consequences and obstacles to national development. Overall, the most vulnerable people to IDA are the poor, particularly those with the least education.[13]

Insufficient food intake, rapid growth, LBW and gastrointestinal losses related to excessive intake of cow's milk are the most common causes of IDA. If we exclude insufficient food intake, but still find the response to drug treatment with iron is not satisfactory, the blood loss should be considered as an underlying cause.[14]

Afghanistan is one of those poor setting countries where the prevalence of anemia, iron deficiency and iron deficiency anemia is at a higher level. The national nutrition survey 2013 shows that 40% of women and 43% of children are anemic. Similarly, the survey result shows that 24.0% WRA and 26.1% children aged 6-59 months were observed iron deficient. The prevalence of iron deficiency anemia among children 6-59 months of age and WRA was 13.7% and 13.8% respectively.[15]

This study will answer the question of "what are the main determinants of iron deficiency anemia among children less than five year and WRA in Afghanistan.

2.2 Justification of the study:

According to WHO, the prevalence cut off values for public health significance; if 20% to 39.9% of a population has anemia, it is considered a moderate public health problem, whereas if 40% or more of a population has anemia, it is considered as a severe public health problem.[16]

Giving the WHO threshold, anemia is a severe public health problem in Afghanistan as the prevalence among children under five and WRA are respectively 40% and 43%.

2.3 Objectives and specific objectives:

2.3.1 Overall objective:

This study aims to identify determinants of iron deficiency (ID) and anemia among children under five and women of reproductive age in Afghanistan, explore the policy and program gaps and provide evidence based recommendation to MoPH to close the gaps.

2.3.2 Specific objectives:

1. To analysis the correlation between socioeconomic status of household and high prevalence of IDA.

2. To explore the dietary pattern consumed by Afghan population and its association on IDA.

3. To analyze the efficiency and effectiveness of the current health system of Afghanistan in response to the infection and diseases that influences the incidence of IDA and addressed the burden of IDA.

4. To analyze mother care during pregnancy particularly in regards to iron supplementation and its impact on pregnancy outcome.

5. To review current policy strategy on public nutrition, highlight the limitations, and provide appropriate evidence based recommendations to MoPH to better address the gaps.

2.4 Methodology:

The methodology is used in this study is "secondary analysis of available data from the National Nutrition Survey, 2013 and literature study". The public nutrition department of MoPH has kindly provided me with the data that was collected in the national nutrition survey 2013. I have further analyzed the data to explore the determinants of iron deficiency anemia using SPSS software.

Numerous resources have been reviewed to identify the main determinants, and effective intervention to control IDA in developing countries[11-23]. It has been identified from literature review that the main determinants of iron deficiency anemia in other countries particularly in developing countries are low socioeconomic status of population, inadequate food intake, prevalence of diseases and responses of health care system to the health problem of population. In this study, the available data are analyzed to identify the association of undernutrition with each of the aforementioned determinants of iron deficiency anemia in Afghanistan.

In addition, a review of published and non-published literature was undertaken to identify the global trends and responses of iron deficiency anemia. Moreover, a review of current Afghan public nutrition policy and strategy and national IYCF strategy was undertaken to find out the gap/limitation in response to micronutrient deficiency, particularly iron deficiency in Afghanistan. A search of the electronic database of UV library, Google scholar, Google, and PubMed was conducted to provide updates information about nutrition, micronutrients and iron deficiency at the global and national levels. Furthermore, a search of the website of some UN agencies that are working for nutrition in Afghanistan such as UNICEF, WHO, FAO, WFP, WB, was also conducted. The key words that are used separately or/and in combination are:

Anemia, Iron deficiency Anemia in Afghanistan, Malnutrition, Under-nutrition, macro nutrient deficiency, IYCF, nutrition survey in Afghanistan, KAP of mother in nutrition

2.5 Conceptual Framework:

The model adopted for this study is the conceptual framework of UNICEF 1992, which has been used for the last 25 years for identifying the following three levels of causes of undernutrition:

1) The immediate causes of undernutrition that is inadequate food intake and diseases. This can be caused by consuming too few nutrients or infection which can increase nutrients requirements and prevent the body from absorbing those consumed.

2) The intermediate causes, which are grouped into three broad categories: Household food insecurity, inadequate care, and unhealthy household environment and lack of health services (poor public health). These are often referred to as 'food', 'care' and 'health' factors.

3) The third level of factors contributing to undernutrition identified by the conceptual framework is considered basic causes. Please refer to Annex 4 the conceptual framework of UNICEF.

According to this framework, undernutrition occurs when dietary intake is inadequate and health is unsatisfactory. These are the two immediate causes of undernutrition. In developing countries, infectious diseases, such as Diarrheal Diseases (DD) and acute respiratory infection (ARI) are responsible for most nutrition-related health problems. Readily available food, appropriate health systems and a healthy environment are ineffective unless these resources are used effectively. As a result, the absence of proper care in households and communities is the third necessary element of the underlying causes of malnutrition. Finally, this conceptual framework recognizes that human and environmental resources, economic systems and political and ideological factors are basic causes that contribute to malnutrition.

This model relates the causal factors for undernutrition with different social-organizational levels. The immediate causes affect individuals, the underlying causes relate to families, and the basic causes are related to the community and the nation. As a result, the more indirect the causes, the wider the population whose nutritional status is affected. Overcoming entrenched poverty and underdevelopment requires resources and inputs. If

the basic causes of undernutrition are to be addressed, greater and better-targeted resources and better collaboration are needed.[17]

The focus of this study is on iron deficiency anemia among WRA and children under five years. The UNICEF conceptual framework gives a broad vision of all causes of undernutrition that encompasses macronutrients and micronutrients deficiencies.

Iron deficiency is a common type of micronutrient deficiency. Hence, exploring the determinants of undernutrition among children will include determinants for iron deficiency anemia. In addition, the national nutrition policy and strategy for Afghanistan also used the same framework; therefore, this study paper will give me a better chance to analyze the gap in the national policy and strategy and provide recommendation to MoPH to better address these gaps.

2.5.1 Risk factors of IDA:

Women are at greater risk of IDA due to blood loss during menstruation. The menstrual iron loss is relatively constant in a woman but varies from woman to woman. The average blood loss in a single menstruation is 25-30ml, which represents an iron loss of 12.5-15mg per month or 0.4-0.5mg/day over 28 days. When basal iron loss is added, the total iron loss for a menstruation woman reaches to 1.25mg/day. Taking into account the menstrual blood loss, 2.5% of women require an excess of 2.4mg/day[18].

Although the menstrual iron lost is reduced to nil during pregnancy the women requires additional iron for the fetus, placenta and her increased blood volume. A total 1,000 mg of iron is required in the entire pregnancy period. The requirement in the first trimester is relatively low (0.8mg/day) but increases in the second and third trimester (6.3mg/day) [18].

During lactation the absence of menstrual iron loss is partially offset by the secretion of 0.3mg iron per day in the breast milk in addition to basal iron lost. It is estimated that a women require 1.3mg iron per day in the first 6 months of lactation[18].

Children, infants, and adolescents require iron for their growing body tissue, and expanded red blood cell mass. A normal infant has 75mg iron per Kg body weight; 2/3 of this iron is in the blood and the remaining 1/3 is stored in the body tissue. In the first two months of life, there is a marked decrease

in the blood concentration and increase in the iron stores. During 4-6 months of life the iron stores decrease to meet the requirements of growing tissue. In the first year of life a baby triples its body weight and doubles its iron stores. Therefore, a child consuming food with low bioavailability iron is at greater risk of iron deficiency anemia[18].

Chronic blood loss such as in the case of parasites and infection put the children at greater risk of IDA. Chronic blood loss can happen in cases of parasites such as hookworms, schistosomiasis, and possibly Trichuris trichiura. This is more common in countries with hot humid climates and poor sanitation. It is estimated that iron lost in a case of hookworm is 0.8-1.2mg per 1000 eggs per gram of faeces[18].

Infections such as viruses and bacteria interfere with food intake and absorption, storage, and use of many nutrients including iron. In a community with poor water and sanitation, the iron intake is low and due to repeated infection the low absorption leads to IDA among children of the same community[18].

CHAPTER 3: Determinants of IDA in Afghanistan and the study finding/results:

There are numbers of studies confirming the effects of socioeconomic situation, prevalence of diseases, food intake pattern and mothers care during pregnancy, delivery and after delivery on prevalence of IDA in developing countries. In this study, we conduct a secondary analysis of NNS 2013 data to explore the relationship between high prevalence IDA and poor socioeconomic situation, inappropriate food intake, prevalence of disease and poor health care and health system. The data that was collected in the NNS 2013 obtained from the nutrition department of MoPH for further analysis to explore the relationship between undernutrition and the main determinants of IDA in the Afghan context. Some of the information was obtained from NSS 2013 report. In addition to secondary data analysis, a literature review was conducted to explore the determinants of IDA in other countries, particularly developing countries.

3.1 socioeconomic conditions and food intake:

Socioeconomic determinants are defined as a social condition in which the people live, work and eat. Family size, house ownership, types of floor and roofs in the houses, and WASH indicators determine the socioeconomic status of families in Afghanistan.

3.1.1 People living condition:

Family size has direct relation to the economic status of households. The result of the study shows that families with eight members and more constitute 43.7% of households, followed by family size of five to seven members (40.6%) and one to four (15.7%). The average family size was 7.33±0.05SD

Regarding household ownership, 86.4% people own their own houses, 7.5% live in rental houses, and 5.6% are live without paying rent for houses. However, 39% live in only two room houses with many family members. 22.3% and 20.6% are livening in one and three rooms respectively. Only 14.7% people have more than three rooms in their houses. Overcrowded and sleeping of large number of children in one room leads to spread of infection particularly ARI, which provide a ground for undernutrition and IDA.

The majority (55.1%) of the people use natural earth floors, while only 40.8% have a finished floor. The majority of people (71.5%) had finished roofs in their homes, followed by rudimentary roofs (16.6%), and natural roofs (0.7%). The majority of respondents reported having rudimentary walls (61.1%), followed by finished (30.5%), and natural (7.9%).

Regarding the electricity and cooking fuel, 40.5% of people use solar panels as their main source of electricity, while 39.2% have connected electricity and 12.6% people are without electricity. Most households (29.8%) use wood as a cooking fuel, followed by 26.9% using cylinder natural gas, 15.4% straw/shrub/grass, and 16.3% animal dung. (Annex 5: housing condition).

Regarding Water Sanitation and Hygiene (WASH) indicators, 62.9% of the households used drinking water from improved sources of water such as hand pump (31%), pipe water (15.1%), protected wall (6.2%), protected spring 3.7% and borehole/tube wheel (5.4%).

The remaining 37.1% of households use water from unimproved sources such as unprotected wells (16.3%), unprotected springs (9.5%), and surface water (9.1%).

The majority (57.4%) of people use water for other purposes (washing dishes, clean the kitchen, wash glasses etc.) from improved sources of water, while the remaining 42.6% use unimproved sources of water.

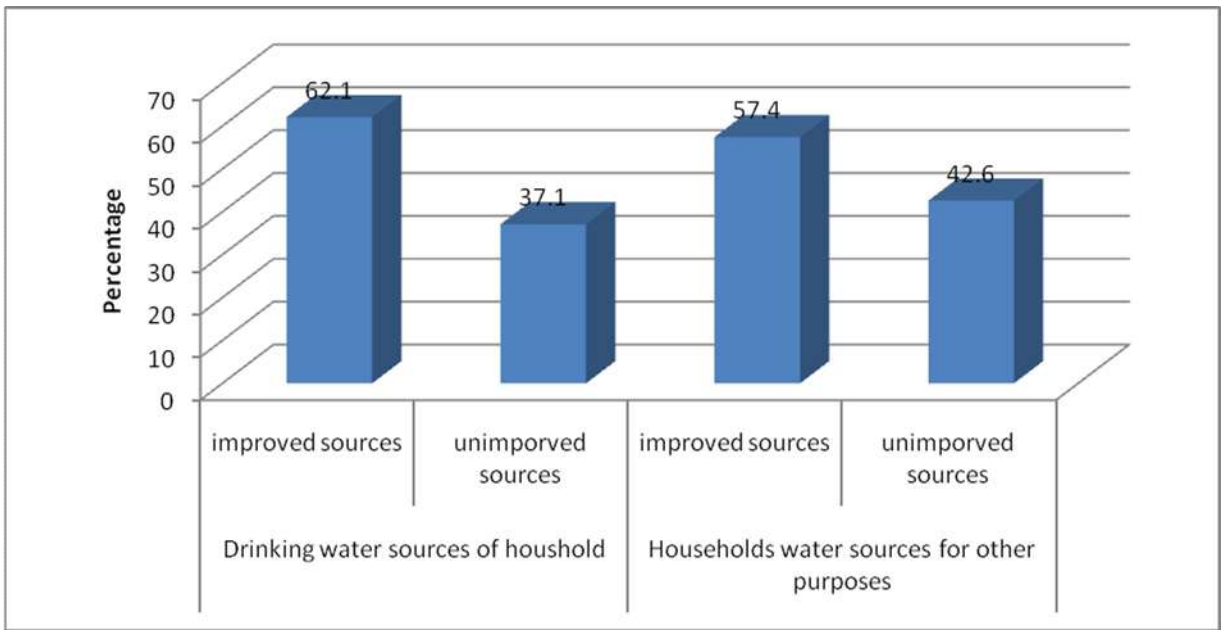

Figure 1: Use of water sources for drinking and household purposes

The survey showed that 53.4% of households didn't have water sources in their houses and they have to fetch it from some distance. 43.6% of the households fetched from less than 30 minutes walk. In (39.5 %) cases, an adult female member of the family has to fetch the water, followed by 30.2% by an adult male. In the remaining 26.6% of cases, children fetched the water.

The majority (58.9%) of people do not have access to improved sanitation facilities. Only 40.4% people use improved sanitation facilities e.g., 17.6% use a latrine with a slab, 44.9% use a pit latrine without a slab. Only 4.2% households use flush sanitation systems. 12.9% people practice open defecation.

Unimproved water sources and latrines facilitate the spread of water born infection and causes diarrhea among children and adults and increase the prevalence of diarrhea and worm infestation. These infections may cause a vicious circle of infection and undernutrition in children, including micronutrient deficiency and IDA.

3.1.2 Dietary intake of nutrients and iron:

Poor socioeconomic situations influence the dietary intake of the children and adults. The dietary requirement varies at different ages. In younger age the IYCF practice is important. In adults and older children, the dietary

intake is dependants on types, varieties and diversity that are directly associated with the socioeconomic status of households.

3.1.2.1 Infant and Young Child Feeding Practice IYCF:

The IYCF practice is perceived to have direct impact on the nutrition status of children in Afghanistan. A woman should consider the feeding of children from the gestational age until two years after delivery. This is total of 1,000 days which is called the golden period. Nutrition during this period influences the whole life of children. Women should be encouraged to breastfeed their babies in the first hour after delivery, breast feed their babies exclusively for six months, introduce complementary feeding from six months onward and continue breastfeeding for two years. Early initiation of breastfeeding is important as they are feeding the newborn with colostrums which is highly nutritious and has antibodies to defend against diseases.

The secondary analysis of IYCF practice in relation with wealth index was performed. Overall 69.4% mothers reported that they feed their newborn in the first hour of delivery. About 70.6% of households in the upper (richest) quintile and 67.3% in the lower (poorest) quintile practice initiation of breastfeeding within the first hour of delivery.

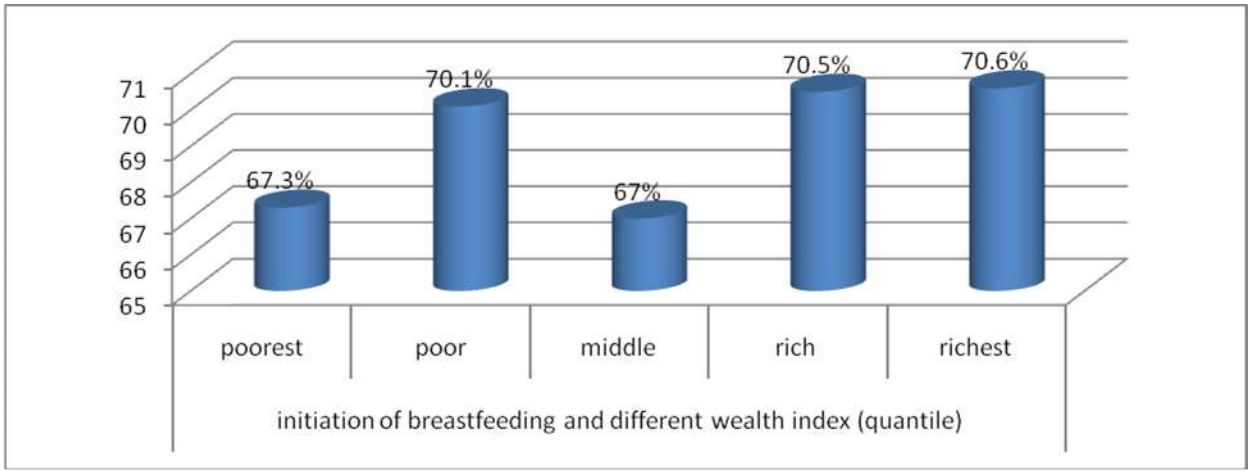

Figure 2 initiation of breastfeeding by mothers of different wealth indexes

Inversely, exclusive breastfeeding practice for five months was better in low or no educated than higher educated women. As shown in table 4, majority (58.8%) of women with higher education breastfeed their babies exclusively, while the figure among illiterate women was 76.4%. Similarly, the wealth index also negatively influences the exclusively breastfeeding practice. Women in the highest (richest) quintile constitute 70.9% of exclusively

breastfeeding practice, while this figure among lower (poorest) quintile was 80.1%.

Moreover, continuation of breastfeeding for two years among higher educated women was poor (53.4%) in compare to the illiterate women and women with lower education (55.7%) and (55.2%) respectively. However, statistically the differences are not significant (P-value=0.102).

Table 3: breastfeeding practice of women in relation to education and wealth index

Women status	N	%exclusively breastfeed	% of continuation of breastfeeding for 2 years
Illiterate women	1831	76.4	55.7
Women with some education	238	81.2	55.2
Women with higher education	56	58.8	53.4
Poorest women	460	80.1	62.9
Poor women	407	80.4	57.1
Middle women	463	81.1	51.9
Rich women	459	74.3	54.5
Richest women	393	70.9	53

Number of correspondents with no education (illiterate) are much higher (4265) than women with some education (2684) and bachelor degree (163). However, the practice of women with a bachelor's degree or above in regards feeding complementary food (solid, semisolid and soft food) to their babies at the age of 6-8 months was better (37.4%) compared to women with some education (32.4%) or no education (31.3%). But statistically this difference is not significant P-value=0.514).

Table 4: complementary feeding practice and education level

			At what age did you feed (name of child) his/her first solid or semi-solid food? Months (Binned)			Total
			< 6	6 - 8	9+	
Education	Illiterate	Count	350	1333	2582	4265
		% within Education	8.2%	31.3%	60.5%	100.0%
	Some school years	Count	224	869	1591	2684
		% within Education	8.3%	32.4%	59.3%	100.0%
	Bachelors and above	Count	14	61	88	163
		% within Education	8.6%	37.4%	54.0%	100.0%
Total		Count	641	2446	4658	7745
		% within Education	8.3%	31.6%	60.1%	100.0%

About 29.2% of the female children received foods from four or more food groups as compared with 26.1% of male children. Children of illiterate mothers (26.4%) were less likely to receive foods from four or more food groups as compared to children of mothers with higher education (34.3%); a similar pattern was observed among poorest (16.9%) and richest households (37.4%).

Table 5: the minimum dietary diversity of children 6-23 months and its relation with wealth quintile and education of mother

Women status	No of children 6-23 months who receive 4 or more type of food during the last 24 h preceding the survey	% of children 6-23 months receives 4 types of food in the last 24 hours preceding the survey.
Illiterate women	4590	26.4
Women with some education	569	32.3
Women with higher education	122	34.3
Poorest women	1115	16.4
Poor women	1090	19
Middle women	1113	23.8
Rich women	1074	31.1
Richest women	1032	37.4

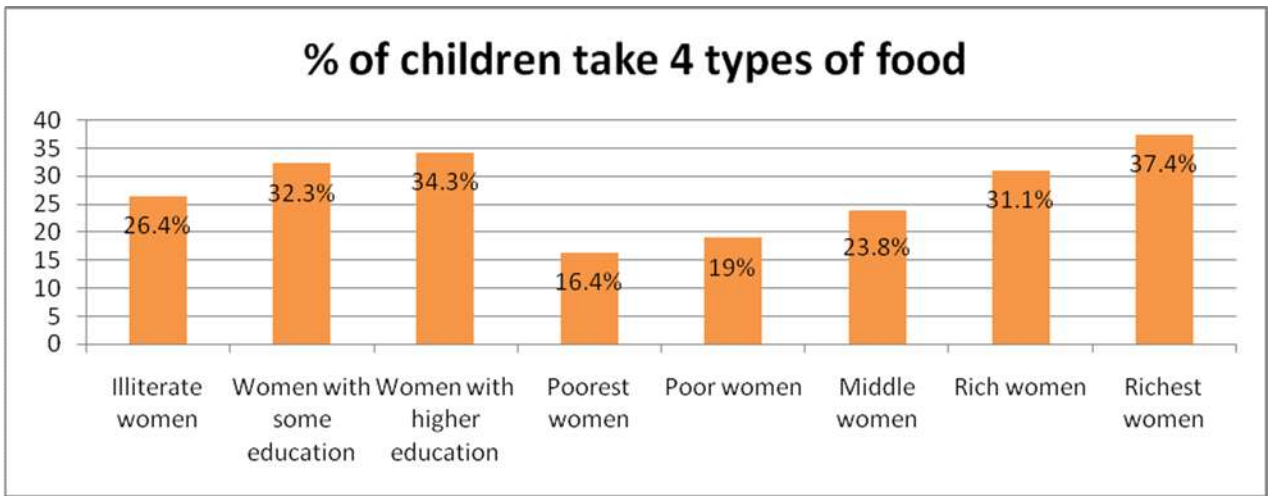

Figure 3: Minimum diet diversity of children 6-23 months of age and its relation with wealth quintile and education of mother

No association of IYCF indicators with stunting was observed. Refer to the data in the table 7. Similarly, there is not any association observed between wasting and exclusive breastfeeding and predominantly breastfeeding (P-value=0.865 and 0.414 respectively). However, there is strong association between wasting and minimum dietary diversity for 6-23 months (P-value=0.012). Those children aged 6-23 months, who take diverse foods, are less likely to develop wasting. Similarly, minimum meal frequency and minimum acceptable diet has a strong association with wasting (P-value<0.05). Moreover, food diversity, frequency and acceptable food are associated with being underweight (P-value<0.05).

From the above analysis we can conclude that there is no association between IYCF indicators and stunting in Afghanistan. Similarly, there is no association of exclusive breastfeeding or predominantly feeding with undernutrition. Refer to the data in the table 7. However, there is strong association of minimum food diversity, optimal food frequency and minimum acceptable food with wasting (WFH<-2SD) and underweight (WFA<-2SD). Wasting is the deficiency of macro and micronutrient including iron.

Table 6: Association of IYCF indicators with undernutrition

IYCF indicators	Wasting<-2SD			Stunting <-2SD			Underweight <-2SD		
	<-2SD	95% CI	P-Value	<-2SD	95% CI	P-Value	<-2SD	95% CI	P-Value

Exclusively breastfeeding 0-5 m	Yes	14.1%	10.9-18.2	0.865	24.7%	21.3-28.5	0.738	21.3%	18.2-24.6	0.665
	No	14.6%	11.5-18.2		23.8%	19.9-26.2		22.3%	18.6-26.5	
Predominantly breastfeeding 0-5 m	Yes	13.8%	11-17.1	0.414	25%	22-28.1	0.440	21.3%	18.6-24.3	0.561
	No	16.1%	12-21.2		22.3%	16.9-28.7		23.1%	18-29.2	
Minimum dietary diversity 6-23 m	Yes	10.3%	8.2-12.8	0.012	35.7%	31.2-40.4	0.122	23.2%	19.9-26.8	0.039
	No	13.9%	12.2-15.9		39.7%	37.3-42.1		27.5%	15.4-29.7	
Minimum meal frequency 6-23m	Yes	10.9%	9.2-12.9	0.001	39.2%	36.3-42.2	0.443	24.2%	21.7-26.7	0.007
	No	15.2%	13.2-17.4		37.8%	35-40.7		28.7%	26.2-31.2	
Minimum acceptable diet 6-23 m	Yes	8.7%	6.2-12.2	0.014	34.1%	28.7-40	0.088	21.6%	16.9-27.1	0.058
	No	13.5%	11.9-15.3		39.2%	36.9-41.5		27%	25.1-28.9	

3.1.2.2 Nutrition status of women of reproductive age and the wealth index:

Apart from children, WRA are also vulnerable to undernutrition and iron deficiency anemia. In the NNS 2013, the women's nutritional status was assessed using BMI.

The survey data shows that mean BMI among WRA (15-49y) was 24.4kg/m^2. Overall 9.2% of WRA were thin (BMI<18,5kg/m^2). The proportion of mild thinness (BMI17-18.5Kg/m^2) and moderate/severe thinness (BMI<17Kg/M^2) are 6.7% and 2.4% respectively. It was also observed that thinness decreased with age, i.e., for aged WRA (15-19 year) mild thinness was 14.4%, and for age range of 45-49 years it dropped to 6.4% (95% CI 4.6-8.8). Similarly, 13.1% of lower quintile women were thin, while the women from higher quintile, it dropped to 5.1%. Moreover, an education level of women also influences the BMI. Illiterate women were observed to be thinner than women with higher education (9.8% Vs 5.2%).

In addition to BMI, measurement of Middle Upper Arm Circumferences (MUAC) was conducted only for index mothers and findings reveal that 13.7% mothers were moderately malnourished (≥ 210 &< 230 mm); among those 3.2% were severely malnourished (< 210 mm).

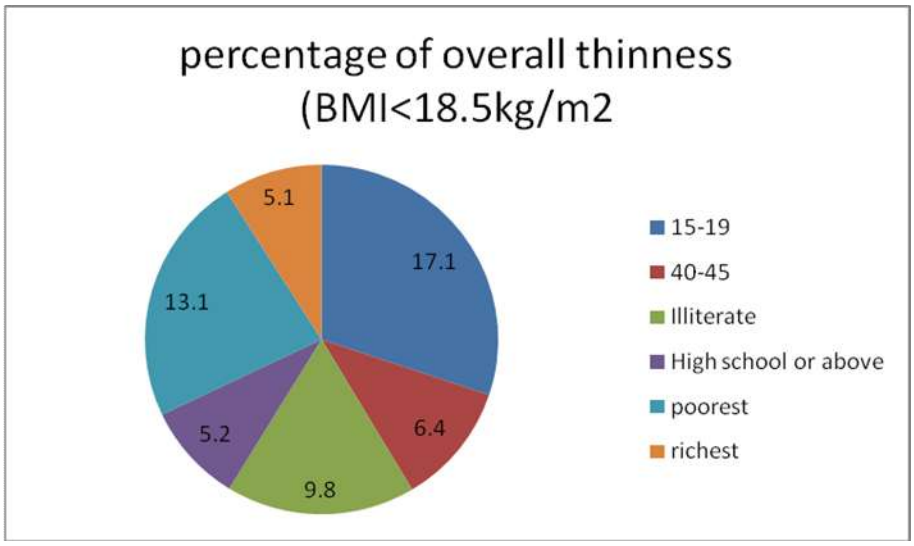

Figure 4: Overall thinness at different age categories, education levels and wealth indexes

Food security of households is assessed using different methods; 1) Food Consumption Score (FCS); 2) Household Hunger Scale (HHS) and; 3) Reducing Coping Strategy Index (RCSI). FCS was used to assess the food diversity of households during the last week preceding the survey using the WFP method; whereas, HHS and RCSI are used to assess availability of food in the household.

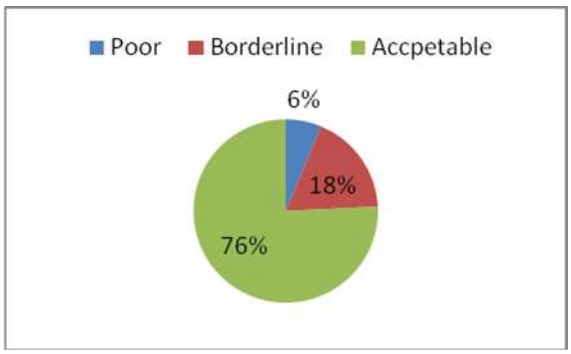

Figure 5: Food consumption score

The result of survey shows that based on FCS 6.3% of households have poor FSC. It means that 6.3% of households have an expected consumption of staple seven days, vegetables 5-6 days, sugar 3-4days, oil/fat one day a week, while animal proteins are totally absent. Moreover, 17.9% of households consume food of borderline diversity. They have an expected consumption of staple seven days, vegetables 6-7 days, sugar 3-4days, oil/fat three days, meat/fish/egg/pulses 1-2 days a week, while dairy products are totally absent. The remaining 75.7% consume absolutely diverse food. This is defined for the borderline group with more number of days a week eating

meat, fish, egg, oil, and complemented by other foods such as pulses, fruits, milk.

Similarly, HHS is a proxy indicator for food security. The result of survey shows that majority of people (84.2%) have no or light hunger, whereas 14% have moderate and only 0.9% have severe hunger.

Table 7: Association of food security indicators with undernutrition

Food security indicators	Wasting<-2SD			Stunting <-2SD			Underweight <-2SD		
	<-2SD	**95% CI**	**P-Value**	**<-2SD**	**95% CI**	**P-Value**	**<-2SD**	**95% CI**	**P-Value**
Household Hunger Score									
No or light hunger (0-1 score)	9.3	8.5 - 10.2	0.030	40.1	38.4-41.8	<0.001	23.9	22.6 - 25.3	<0.001
Moderate hunger (2-3 score)	10.8	9.1 - 12.8		46.1	43.2-49.1		30.1	27.3 – 33	
Sever hunger (4-6 score)	15.5	10.2 - 22.8		46.8	37.4-56.3		42.0	31.5 - 53.3	
Food consumption Score									
Poor (1-28)	9.9	8.1 - 12.1	0.835	44.7	41.1 - 48.4	0.006	28.2	24.6 - 32.1	0.002
Borderline (28.1-42)	9.8	8.4 - 11.5		43.7	41.1 - 46.3		28.2	25.9 - 30.6	
Acceptable (>42)	9.5	8.5 - 10.5		40.2	38.4 - 42		24.1	22.6 - 25.6	

The above finding shows that there is a strong association of HHS with wasting (P-value=0.03). It means that 9.3% of households with no or a light hunger score developed wasting (<-2SD), whereas 10.8% and 15.5% of households with moderate and severe HHS developed wasting. However, there is no significant association between wasting and FCS (P-value=0.835).

Stunting has a strong association with both FCS and HHS food security indicators. The association stunting with HHS is significant (P-value<0.001). The association of stunting with FCS is also significant (P-value<0.006).

Similarly, the association of underweight with both food security indicators is significant (P-value-0.001 and 0.002).

3.2 Health care and diseases:

3.2.1 Child health and diseases:

Undernutrition and diseases are two different problems that fall on children in a vicious circle. The disease reduce the defense mechanism of the body provides a bed for more infection and it further weakens the defense system.

In the NNS 2003, the index mother of children was asked if they had sickness e.g., diarrhea, ARI, and their associate symptoms and other morbidity on the day of interview and/or up to two days before.

The majority (64.7%) of respondents reported some type of diseases during the two weeks preceding the interview. Most of the ill children complained of diarrhea and symptoms of ARI e.g., cough/flu, and fever that are confirmed to influence the nutritional status of children.

Table 8: association of diarrhea and ARI with nutritional status of children under five

Morbidities		N	<-2SD	95% CI	P-value
Wasting					
Diarrhea in the last two weeks	Yes	4886	12.8	11.3-14.4	
	No	7268	13.3	12,1-14.7	0.512
ARI in the last two weeks	Yes	1874	13.5	11.2-16.2	
	No	10697	13.1	11.9-14.4	0.771
Stunting					
Diarrhea in the last two weeks	Yes	4170	38.8	36.4-41.2	
	No	7142	36.1	34.1-38.2	0.026
ARI in the last two weeks	Yes	1854	39.9	36.7-43.1	
	No	10453	36.8	34.9-38.8	0.058

Underweight					
Diarrhea in the last two weeks	Yes	5104	28	30.3-69.7	
	No	7628	25.5	27.2-72.8	0.04
ARI in the last two weeks	Yes	1976	28.2	31.5-68.5	
	No	11195	26.2	27.9-72.1	0.227

Interestingly, the 2013 survey does not show an association of diarrhea and ARI with wasting (P-value=0.512 and 0.771 respectively); however there is a positive association of diarrhea and ARI with stunting (P-value=0.026 and 0.058 respectively). Moreover, diarrhea has positive association with underweight (P-value=0.04); whereas, the association with ARI and underweight is not significant (P-value=0.227). We can conclude that disease such as diarrhea and ARI influence chronic malnutrition such as stunting and underweight. Chronic malnutrition and micronutrient deficiency in particular iron deficiency anemia are attributable to certain diseases such as diarrhea and ARI.

3.2.2 Maternal health:

The secondary analysis of NNS shows that 48.1% women sought antenatal care (ANC) during their last pregnancy at the national level. Among them, only 16.4% of women had four or more ANC visits. Only 24.7% had their first ANC in their first trimester, 10.8% visited for the first time during 4-5th month and 12.1% after sixth month of pregnancy. During ANC visit, the women received the services of blood pressure (BP) measurements (68.9%), weight measurements (35.8%), ultrasound scan (41.5%), urine sampling (22.3%), and blood sampling (15.4%). During ANC visits, 47.7% women received information and counseling about eating more nutritious food followed by advice to take extra rest (42.3%) and exclusive breast feeding (15.5%). Almost 21.9% women did not receive any relevant information during visits.

In a pregnant woman, iron requirement during second and third trimester is increased. According to NNS secondary data analysis, iron is mainly supplemented to the pregnant women in the first trimester was (83.3%) and reduced in the second and third trimester (6% and 3.5%) respectively.

Intestinal worm is one of the causes of iron deficiency anemia among pregnant women and children. According to NNS, only 3.8% of women received drug for intestinal worm during pregnancy.

3.3 conclusions of findings:

It was revealed on the result of literature review that the main determinants of iron deficiency anemia are low socioeconomic situation, poor food intake, high prevalence of certain diseases such as ARI, diarrhea, worm infestation and malaria and poor responses of health system.

The result of secondary data analysis shows poor socioeconomic situation of households affects the nutrition status of children and mothers either due to inability of household to purchase foods or due to poor sanitation. The result shows, that 62.9% of household have access to improved sources of water; whereas, the remaining 37.1% fetch their water from unimproved sources, which is the main sources of infection. Around 1/3 of children received 4 types or more diverse foods during 24h proceeding the survey and this figure in richest households was higher 37.4% than poor households 16.4%.

It has been revealed that there is no association between IYCF indicators and stunting. Similarly, there is no association of exclusive breastfeeding or predominantly feeding with undernutrition.

However, there is strong association of minimum food diversity, optimal food frequency and minimum acceptable food with wasting (WFH<-2SD) and underweight (WFA<-2SD). Wasting is the deficiency of macro and micronutrient including iron.

High prevalence of certain diseases such as ARI and diarrhea among children under five years are another factors contributing to high prevalence of undernutrition. Diseases fall on children in vicious circle of undernutrition and infection. The result of NNS study shows the disease influence chronic malnutrition such as stunting and underweight. Chronic malnutrition and micronutrient deficiency in particular iron deficiency anemia are attributable to certain diseases such as diarrhea and ARI.

3.4 progress in nutrition indicators:

In Afghanistan the previous nutrition survey was conducted in 2004.

Comparing the two surveys, there is tremendous improvement in the nutrition indicators of children in Afghanistan. The moderate and severe

stunting reduced from 60.5% to 40.9% and from 32.6% to 20.9% respectively. Similarly, there is apparent improvement in underweight; moderate underweight reduced from 33.7% to 25% and sever underweight reduced from 12% to 9.7%. However, there is a not apparent change in acute malnutrition of children. The NNS 2004 shows that 8.9% of children suffering from severe wasting; whereas, the NNS 2013 shows this figure 9.5%. And the moderate wasting rate reduced from 4.75% to 4%.

Table 9: Comparison of nutrition indicators of NNS 2013 with NNS 2004

	NNS 2013		NNS 2004	
	<-2 Z-score	<-3 Z-score	<-2 Z-score	<-3 Z-score
Stunting (HAZ)	40.9 (CI 39.3-42.51)	20.9 (CI 19.73-22.21)	60.5 (CI 57.2-63.7)	32.6 (CI 29.4-35.7)
Underweight (WAZ)	25.0 (CI 23.76-26.29)	9.7 (CI 8.9-10.58)	33.7 (CI 30.6-36.8)	12.0 (CI 9.9-14.2)
Wasting (WHZ)	9.5 (CI 8.73-10.4)	4.0 (CI 3.51-4.62)	8.7 (CI 6.8-10.5)	4.7 (CI 3.2-6.1)

CHAPTER 4: CURRENT STRATEGIES, INTERVENTIONS AND LIMITATIONS:

The public nutrition policy and strategy of Afghanistan has defined areas of interventions to address micronutrient deficiency among the population, but there are some shortfalls and limitation in the policy, intervention and implementation. This chapter will especially focus on current policy, strategy and the limitation of strategy and the gap between policy/strategy and the implementation of the all programs that addresses micronutrient deficiency and in particular iron deficiency anemia in Afghanistan.

4.1 current strategies and interventions:

4.1.1 Food modification:

WHO recommends two ways to increase dietary intake in poor countries; 1) increase the amount of food consumed by the population to fill the energy gap that increases the intake of extra iron available in the larger amount of habitual food. However, the intake of extra iron is difficult to measure as we do not know how much of depleted iron is replaced by increasing the amount of food and; 2) enhancing the bioavailability of iron ingested. Several strategies are suggested, but all are based on promotion of the intake of iron absorption enhancers including haem iron and reducing the ingestion of absorption inhibitors such as tannin and phytic acid.[18]

Community awareness to promote the enhancement of iron ingestion plays a key role in Afghanistan. The Afghanistan national nutrition policy and strategy address this problem under the "Strategies for Nutrition Promotion at National, Provincial and Community levels" with the objective "To increase the awareness about nutrition amongst the general population, and provide caregivers with the knowledge, skills and support that are required to adopt healthy nutrition practices, using food-based approaches". However the limitations of the current interventions are limited to awareness rising activities.

Behavior change requires grounds to move people from awareness to action. Various stakeholders are testing community based nutrition promotion interventions, such as: promoting healthy nutrition through participatory nutrition activities, including and promotion of appropriate use of local products and participatory cooking sessions, linked to household food security interventions; application of the Positive Deviance (Hearth) model; and piloting of community-based Growth Monitoring and Promotion (C-GMP).

The C-GMP pilot notably attempts to establish a mechanism to mobilize communities to support various health promotion activities by linking Community Health Workers (CHWs) to Family Health Action Groups (FHAG).

4.1.2 Food fortification:

The fortification of a widely consumed and centrally processed staple food with iron is the backbone of anemia control in many countries. Fortification involves centralized decision-making, legislation, and action by flour mills and other food processing plants[13].

The Afghanistan national nutrition policy and strategy address this problem under the "Strategies to address Micronutrient Deficiency Disorders" with the objective "To reduce the prevalence of major micronutrient deficiency disorders, in particular iron, folic acid, iodine, vitamin A, and zinc, throughout the country, and prevent possible outbreaks of vitamin C deficiency". The limitation in the current intervention and policy/strategy are that micronutrient-rich foods are currently being promoted through general nutrition education activities. However, these activities have had limited coverage and scope. More efforts are required to increase the population's knowledge about the nutritional value of different foods and skills for producing and optimally utilizing micronutrient-rich foods. When the small-scale fortification project began, no large mills were functioning in the country. Since then, several large-scale mills with modern technology have begun operating in some of the bigger cities, including Kabul (160 MT/day), Hirat (220 MT/day), Mazar (200 MT/day), and Kunduz (100 MT/day). Involving these mills in fortification and enforcing legislation prohibiting the importation of unfortified flour will contribute greatly to reducing and potentially eliminating micronutrient deficiencies among the Afghan population, especially as almost everyone consumes bread on a daily basis.[19]

The ministry of public has not developed standards for food fortification yet. The international organizations and UN agencies who want to work on food fortification have determined the types of food for fortification using international standards. However, the type of food needs to be identified by the government for fortification. In addition, there is neither capacity with the flour mills nor with the government to perform legal quality control checking of fortified flour. Commercially imported flour is not fortified; there is no national regulation to promote importation of fortified flour. There is no system in place to monitor the household's coverage of fortified floor in urban areas.

4.1.3 Iron supplementation:

Supplementation of iron in the form of tablets, syrups, drops, and injection has the advantage of producing rapid improvements in iron status. As a strategy, it also has a desirable specificity: it can be targeted at the population groups in greatest need of iron or at greatest risk of becoming iron-deficient. Indeed, iron supplementation programs have a greater chance of success when directed at specific groups[13].

According to the public nutrition policy and strategy of Afghanistan, supplementation of key micronutrients is part of the BPHS and EPHS. Iron/folic acid supplements are given to mothers as part of ante-natal and post-natal care and vitamin A supplements are given post-partum. Furthermore, preventive distributions of vitamin C tablets are done in scurvy-prone areas (remote, drought-prone districts). The limitations of the current interventions are:

The majority of the population does not routinely access health facilities for preventive services (including ante- and post-natal care) and most deliveries are conducted at home by a traditional birth attendant, so the coverage of iron supplementation is low. Moreover, the compliance with the MoPH protocol by the implementing partners is limited as the Ministry does not have the capacity to supply iron to all health facilities. Furthermore, there is not any operation manual to guide health providers in how to deliver preventive and therapeutic micronutrients supplements. For example, the NNS 2013 shows, more than 83% of women received iron supplementation in the first trimester and reduced to 6% and 3.5% in the second and third trimester respectively, while the requirement of iron in the first second and third trimester is much higher than the first trimester. Unavailability of coverage data for supplementation through the HMIS is another limitation. Vitamin A supplementation for children is entirely dependent on NIDs, and no plan has been prepared for vitamin A supplementation post-National Immunization Day (NID).

4.1.4 Control of infectious diseases:

Effective, timely curative care could reduce duration and severity and diminish the adverse nutritional consequences of diseases. This would help to improve iron status even if there is no increase in dietary iron consumption. Preschool children, in particular, would benefit from such improvements in health care[13].

In Afghanistan, the most common causes of mortality and morbidity are neonatal deaths (36% of U5 deaths), pneumonia (18% of under five and 2% of newborn), diarrhea (13% of under five and 1% of newborn), measles (3%), and malaria (0%).[20] Infectious disease causes vicious circle of infection and diseases which ultimately leads to all nutrients deficiencies including iron deficiency. The MoPH provides basic health services to the population of Afghanistan through BPHS and EPHS.

The Afghanistan national nutrition policy and strategy address this problem under the "Strategies for Adequate Management of Severe Acute Malnutrition" with the objective "To reduce mortality from severe acute malnutrition through strengthened case management and increased access to quality therapeutic feeding and care at health facility and community levels". However the limitation in the current intervention and policy/strategy are described below:

Since 2002, the MoPH has established 47 Therapeutic Feeding Units (TFUs) at provincial hospitals and selected district hospitals in 32 provinces. The coverage of TFU's remained limited because of access difficulties between provincial or district hospitals and villages. Iron supplementation was part of routine ANC program. Defaulter rates were observed to be high as few mothers are able to stay for the entire length of treatment in the TFU. For these reasons, a simplified version of Community-based Management of Acute Malnutrition (CMAM) was piloted in partnership with BPHS NGOs in nine provinces. A Supplementary Feeding Program (SFP) component was added in early 2009 to the CMAM pilot in selected areas for the management of moderate acute malnutrition and follow-up of treated SAM patients.

The treatment protocol of acute malnutrition varies based on superadded infection and nutritional status of children and women. The treatment of acute malnutrition with no complications is achieved at the community level, while cases with complications are admitted at the health center. The classification of severe and moderate cases is defined by anthropometric measurement or presence and grade of edema. The below figure shows the treatment protocol of acute malnutrition in Afghanistan:

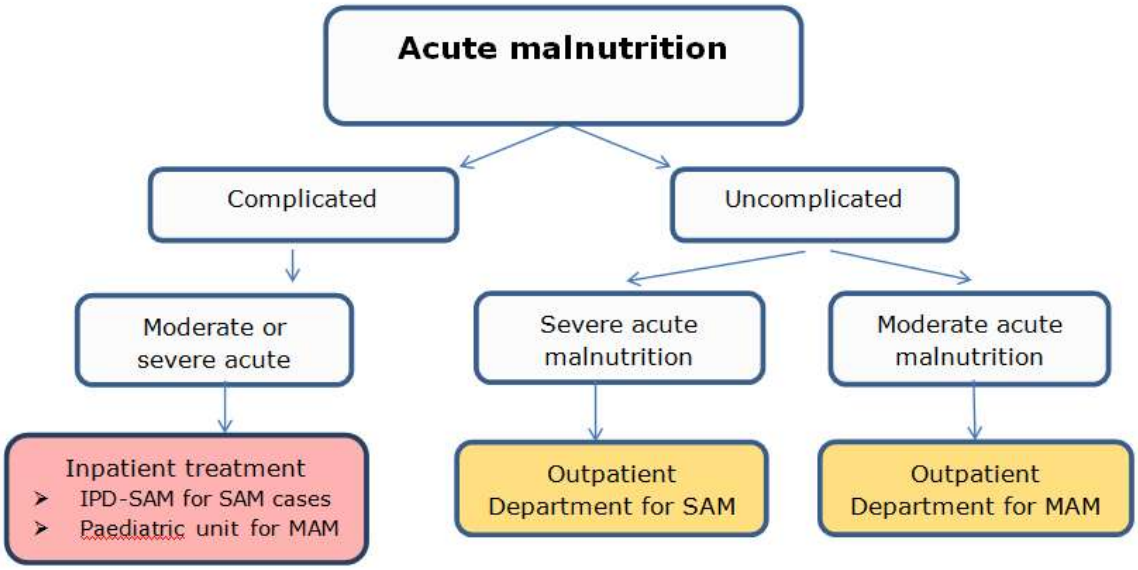

Figure 6: treatment protocol of undernutrition

The assessment of acute malnutrition varies in different age groups. In children between 6-59 months, Mid-Upper Arm Circumferences (MUAC), weight for height (W/H Z-score) and present and grade of edema are used. The presence of any of the above criteria allows eligibility for treatment of severe malnutrition. Preferably MUAC is used for its simplicity and feasibility in poor settings. The diagnostic cut off of Moderate Acute Malnutrition in children 6-59 months is -2SD to -3SD Z-score, while for Severe Acute Malnutrition (SAM) it is -3SD and lower Z-score.

Similarly, a child is diagnosed SAM when the MUAC shows less than 11.5cm and MAM if it is11.5-12.5cm. A child should be discharged with the same anthropometric tools as admitted. The presence of edema in the lower limb of children is a diagnostic criteria of SAM.

Table 10: diagnostic cut off of children 6-59 months

Age	Criteria	
	Moderate Acute Malnutrition	**Severe Acute Malnutrition**
6 to 59 months	❖ MUAC: between 12.5 to 11.5 cm	❖ MUAC less than 11.5cm **or**

	or ❖ WFH/L between -2 to -3 Z-scores **and** ❖ Edema is absent	❖ WFH/L less than -3 Z-scores **or** ❖ Bilateral edema is present

A child may develop the below complications during the acute phase of malnutrition and should be admitted to the hospital for medical and nutritional treatment:

Table 11: medical complication of SAM

Clinical complication	Criteria
High fever	Greater than 39 C (102.2 F)
Hypothermia	Less than 35.5 C (96 F)
Persistent vomiting	Vomits all food and fluids
Severe dehydration	Clinical signs + recent history of fluid loss
Severe anaemia	Severe palmar pallor
Unconscious / convulsing	Reduced level of consciousness / lethargy / fitting
Difficult or fast breathing	2 to 12 months Greater than 50 breaths / min 12 to 59 months Greater than 40 breaths / min
Skin lesions	Extensive skin ulceration requiring IV / IM antibiotics

The diagnostic cut off for pregnant and lactating women are made by measurement of MUAC (<23cm).

Category	Criteria
Pregnant women ➢ From the 2nd Trimester	MUAC < 23cm
Lactating Women ➢ Breastfeeding infant aged less than 6 months	

The treatment of children with acute malnutrition is achieved at the following four levels:

1- Community outreach

2- Outpatients Therapeutic Program (OTP)

3- Stabilization Centers (SC) and

4- Supplementary Feeding Program (SFP).

At the community outreach level the volunteer community health workers (CHWs) perform screening and referral services. This is to maximize coverage of nutrition program.

Children with acute malnutrition and no complications are treated at the OTP. Children with MAM are prescribed Ready to Use Supplementary Food (RUSF) and with SAM Ready to Use Therapeutic Food (RUTF). This feeding package is prescribed with routine medication.

Children with acute malnutrition and complication are admitted in the hospital (SC) for completion of treatment of complication and feeding. When the infection is subsided, the nutrition rehabilitation is planned at home under observation of CHWs.

The Supplementary Feeding Program is for prevention and treatment of pregnant and lactating women with acute malnutrition. Women with moderate and severe malnutrition during pregnancy and lactation receive special rations that include flour, beans, cooking oil, etc. that meet the nutrition and energy requirements of women.

According to UNICEF nutrition bulletin for Afghanistan[9], total number of children with severe undernutrition received nutrition services and treatment in the first quarter of 2015 is 60,243, which shows 95% improvement than

2014, but it encompasses only 15.5% of total acute undernutrition cases. This estimation is bases on result of NNS 2013 that shows 9.5% children are severely acute undernutrition (<-2SD). A total of 46,333 children received Micronutrient Powder (MNPs) which forms only 8% of total 6-23 months children. Similarly, a total of 31,907 (30%) pregnant and lactating women were reached with food ration for acute malnutrition treatment in the first quarter. From the above figures, we can elucidate that inspite of progress made in the treatment of acute undernutrition cases; the coverage is still very low.

4.2 Study limitation:

The methodology used in this study is the literature review and secondary data analysis. The ministry of public health provided the whole data. It was supposed to receive the whole data through internet, but due to heavy load, few data made available. Therefore, I traveled to Kabul to obtain the remaining data. I could get the whole data, but some of them such as prevalence of micronutrients were not available at the ministry. It was very necessary to measure the association of undernutrition and micronutrients particularly iron deficiency anemia by calculating the P-value but due to lack of appropriate module of data, the association is not measured. On the other hand, having the basic knowledge in SPSS, the data analysis was done at the very preliminary level. Moreover, the result of NNS 2013 report was used to further explore the causes of iron deficiency anemia.

CHAPTER5: BEST PRACTICE, LESSON LEARNT FROM OTHER COUNTRIES

5.1 Intermittent iron supplementation:

One of the limitations of iron supplementation is poor compliance with the iron therapy for longer duration of time especially in children.

A Cochrane systematic review was conducted by WHO to assess the effect of intermittent iron therapy alone or in combination with other micronutrients in children less than 12 years. The study compared the effect of intermittent iron supplementation along and/or in combination with a placebo group and daily use of iron in a variety of settings including malaria endemic areas. The result showed that intermittent iron supplementation increases the level of HB in compared to the placebo group and continuous supplementation group. The mean hemoglobin difference in 19 studies was 5.20g/l, (95% CI 92.51-7.8) and the mean ferritin difference in five studies was 14.17µg/l, (95%CI 3.53-24.81) and reduced the risk of presenting anemia at the end of the intervention (relative risk (RR) 0.51, 95% CI 0.37–0.72, 10 studies).[21]

5.2 Food fortification:

There is a growing consensus based on long standing experience that in the middle and low income countries where the population is suffering from iron deficiency anemia it is desirable to restore and prevent iron depletion through fortification of food staple such as wheat, maize and flour or condiments such as soy sauce, fish sauce, sugar, and salt with iron. Technical experts believe that significant depleted iron can be restored if we fortify main staple foods such as flour, wheat, maize and rice, which is cost effective and sustainable. But infants and young children can't benefit from main staple fortification; therefore, the fortification of supplementary food is suggestive in this age group.[22]

5.3 Dietary modification:

It was agreed that countries with public health problems of iron deficiency should promote dietary improvement as a part of an integrated strategy to prevent iron deficiency, but this cannot be expected to solve the problem on its own. It is important to learn of those commonly consumed foods and meals that contain iron and promote its absorption, and then to promote more use of these in family diets. However, iron nutrition improvement based on dietary promotion is generally limited because the iron availability in vegetables is poor and attempts to increase meat consumption, with its

better-absorbed iron, are often met by economic and sometimes religious constraints[17].

5.4 Iron supplementation during pregnancy:

A randomized control trail study was conducted by (Mary E, Cogswell et al), to explore the effect of iron supplementation on the pregnancy outcome of mothers who started iron supplementation before the 20th weeks and continued until 28 weeks of gestation. The result of a study on the intervention group compared with placebo, iron supplementation from enrollment to 28 wk of gestation did not significantly affect the overall prevalence of anemia or the incidence of preterm births but led to a significantly higher mean (± SD) birth weight (206 ± 565 g; P = 0.010), a significantly lower incidence of low-birth-weight infants (4% compared with 17%; P = 0.003), and a significantly lower incidence of preterm low-birth-weight infants (3% compared with 10%; P = 0.017).[23]

A 2009 Cochrane review found that iron supplementation improved birth length and that iron–folic acid (IFA) supplementation improved birth weight.[24]

Conversely, despite the iron and folic acid supplementation in the last few decades, there was no marked improvement in anemia status in Bangladesh.

For women during pregnancy and lactation, the program provides IFA (60mg iron and 400µg folic acid) from second trimester onward until 42 days after delivery. In addition, the national nutrition program provides a dietary promotion program to the women through the community nutrition program. Several national and international organizations also provide IFA to the community at the rural and urban areas. Girls are not included in this program; therefore, girls studying at 7-10 grades are receiving IFA capsule at their schools. In addition, adolescents receive IFA through the RTI/STI program. Children aged less than five years are not routinely given any intervention to prevent and control anemia. IMCI is addressing malnutrition along with NNP. The NNP also promotes breastfeeding; complementary feeding through the CNPs. De-worming of children aged 24-59 months with albendazole is included during the six-monthly check-up.

Despite IFA supplementation being in place for many years, the magnitude of anemia is still high. A holistic approach to control anemia emphasizing on training of the workers, community awareness, expansion of iron

supplementation areas, and population targeting is recommended. Evidence-based approaches would result in successful anemia control.[25]

5.5 Micronutrient Powders (MNPs)

Supplementation of iron with MNPs is a short term solution to quickly restore iron depletion in a community. The mid-term solution is food fortification and bio-fortification which may take years to plan, pilot and implement. The long term solution for iron deficiency anemia is a genuine change in food security and diet that may require fundamental socioeconomic and dietary change. A comprehensive approach to control iron deficiency anemia may require short term, medium and long term solutions simultaneously. In such cases, once mid and long term solutions are established, the short term solution should be removed from the program as iron intervention will only benefit iron deficient individuals. In a setting where there is no policy in place to control IDA, the iron with folate should be provided during early pregnancy as it improve both maternal and infants' outcomes, which is safe, cheap, and easy to implement. Providing iron to non-pregnant WRA, older infants, and young children can then follow, together with medium- and longer-term strategies. Distribution of iron has been recommended by international organizations for many years, there has been minimal improvement in the burden of anemia in many low income settings. Optimized public health systems and partnerships between funders, policymakers, and program managers are needed to develop and implement anemia control interventions and to ensure their safe and effective delivery by health workers in the field to the people who are at risk[23].

CHAPTER 6: DISCUSSION, CONCLUSION AND RECOMMENDATION

6.1 Discussion:

This study is designed to explore the main determinants of iron deficiency anemia in Afghanistan. The model adapted in this study is the UNICEF conceptual framework of undernutrition, which will indentify the determinants of undernutrition at immediate, underlying and basic levels. Based on framework, the immediate causes of undernutrition are inadequate food intake and high prevalence of diseases, which are measured at the individual level. The underlying causes are defined as insufficient access to food, inadequate maternal and child care practice and poor water and sanitation and inadequate health services, which are measured at the household level. And the basic causes are the quality and quantity of potential resources e.g. human, financial and organizational resources, which is measured at the population level.

Micronutrient deficiency is a form of undernutrition and iron deficiency anemia is a common type of micronutrient deficiency. In this study, we explore the determinants of undernutrition at all levels of UNICEF conceptual framework which will represent the determinants of iron deficiency anemia.

6.1.1 Inadequate potential resources:

In Afghanistan, resources such as human, financial and organizational are the main challenges to provide adequate health care services. Female staffs play a very important role in health system and to provide health care service to the people. Culturally, the women are not welling and/or allowed to work especially in unsecure areas that result to a particular shortage of female staff. According to BMC health services 2014, more female staffs such as doctors, nurses, midwives and CHWs are required to meet the requirement of health system in Afghanistan.[26]

Scientific and regular finance is necessary for health system to perform. The extends to which a country commit their resource to health reflect the priority of health. In Afghanistan, only 7% of GDP is allocated for health, which meets the minimum requirement of health system.

Governance is the ability of the health system to respond to the needs of different population groups at various levels of the health system.

6.1.2 Insufficient access to food:

There are two types of dietary iron: haem and non-haem. Haem is the constituent of hemoglobin and myoglobin and is mainly present in meat, fish and poultry. Non-haem iron is found in foods of plant origin. In Afghanistan, poverty and low food intake may tend to exacerbate the less use of haem iron. From other hand, even people have enough to eat; children and women are at greater risk as they don't consume more energy and eat less food that leads to iron deficiency. Many compounds tend to increase iron absorption such as fish and meat that not only provide sufficient iron to the body but they increase the absorption of iron from other sources. Similarly, citrus and cauliflower that contain ascorbic acid facilitate the absorption of iron. Conversely, there are some other compounds that inhibit iron absorption such as phytate, tannins and soy protein. People in Afghanistan, especially in the northern area, customarily drink tea instead of water with lunch and dinner and tea contain tannins and inhibits iron absorption.

A focus on IYCF indicators will improve feeding practice of babies after deliveries. Initiation of breastfeeding within one hour after delivery, exclusive breastfeeding, complementary feeding and continuation of breastfeeding are more important IYCF indicators to improve feeding of children during infancy and childhood. However, the result of NNS 2013 shows there is not any association between IYCF indicators and stunting in Afghanistan. Similarly, there is no association of exclusive breastfeeding predominantly feeding with undernutrition. But there is strong association of minimum food diversity, optimal food frequency and minimum food acceptability with wasting (WFH<-2SD) and underweight (WFA<-2SD). Wasting is the deficiency of macro and micronutrient including iron. Food fortification with micronutrient are advisable in this country, but still this group people (children less than two years) will not benefit from this intervention; therefore, complementary food for small babies needs to be fortified.

Children above two years consume the same food as adults. The wealth index has a direct impact on food diversity, frequency, and acceptable food to meet the energy and micronutrient requirements. Mothers in the richest quintile of wealth had better nutritional status than those in the poorest quintile. We should not ignore silent undernutrition among women in the richest wealth quintile. They are well off to afford the quality and quantity food, but they are lacking knowledge of importance of diverse and iron-rich

food. Therefore, the government needs to focus on education and awareness rising interventions to increase their knowledge on importance of diverse food to themselves and their children.

6.1.3 Poor water, sanitation and health system:

Only 62.9% people have access to improved sources of water and the remaining people fetch waster from unimproved source. Unclean water is the main causes of infection such as bacteria, virus and worm infestation that directly impact the nutritional status of children and mother. Control of disease has its direct impact on consequences on undernutrition. Iron supplemented mainly during ANC visit to the pregnant mother. The result of survey shows that only 16.4% of women had four or more ANC visit. Only 24.7% had their first ANC in their first trimester, 10.8% visited for the first time during 4-5th month and 12.1% after sixth month of pregnancy. In a pregnant woman, iron requirement during second and third trimester is increased. According to NNS secondary data analysis, iron is mainly supplemented to the pregnant women in the first trimester was (83.3%) and reduced in the second and third trimester (6% and 3.5%) respectively. Intestinal worm is one of the causes of iron deficiency anemia among pregnant women and children. According to NNS, only 3.8% of women received drug for intestinal worm during pregnancy.

6.1.4 Inadequate food intake and diseases:

Inadequate food intake and diseases are linked to poor socioeconomic condition of population. People with poor socioeconomic situation will develop undernutrition due to inability to purchase adequate food to meet the requirements of daily energy requirement, and poor access to clean water and improved sanitation, which will gradually lead to undernutrition and iron deficiency anemia. Large family sizes, poor housing condition, inadequate food intake are the consequences of poor socioeconomic condition of people in Afghanistan

More than 80% of OPD cases among children including diarrhea, ARI, malaria and measles. Although drug therapy doesn't have any influence on prevalence of disease it will reduce the frequency and duration of disease, which will have direct impact on undernutrition consequences of diseases. A patient with severe acute malnutrition SAM and infection requires special attention to be treated in the IPD in the stabilization center. In addition, patients without Complication require ambulatory treatment, under close observation to control the infection. The result of this study shows that there

is not any association between diarrhea, ARI and wasting (P-value=0.512 and 0.771 respectively); whereas, the association between stunting and diarrhea and ARI is positive (P-value=0.026 and 0.058 respectively). Similarly, the association between underweight and diarrhea is also positive (P-value=0.04).

6.2 Conclusion

The result of this study shows that there is strong link between iron deficiency anemia and socioeconomic condition of population, prevalence of diseases, response of health system to the health need of population and food intake pattern in Afghanistan.

Socioeconomic conditions are defined as the people live, work and eat. People living condition such as water, sanitation and hygiene are important contributing factors in causing diseases and undernutrition. In Afghanistan, majority of people (62.9%) obtain their drinking water from improved sources such as hand pump, pipe water, protected springs, and borehole/tube wheel. However the remaining 37.1% fetch their drinking water from unimproved sources such as unprotected wheel, unprotected spring and surface water, which are contaminated with bacteria, virus and parasite.

Overcrowded living conditions in a smaller house determine the socioeconomic condition of households and population. The result of this study shows that 43.7% of families are with living with eight or more number of family members. Similarly, the percentages of families with five to seven members in their households are 40.6%. On other hand, 39% of families living in two room houses the majority of them are with bigger family size. Overcrowded facilitate the spread of infection from one person to another and increase the episode of infection in children. The result of survey shows that majority of children 64.7% reported some type of diseases mainly ARI and diarrhea during two weeks preceding the survey.

In this survey, food security indicators were measured by food consumption score (FSC), household hunger scale (HHS) and reducing coping strategy index (RCSI). The study shows a positive association of HHS with wasting (P-value=0.03). It means that 9.3% of households with no or a light hunger score developed wasting (<-2SD). The family knowledge, attitude and practices involved in wasting. Only 10.8% and 15.5% of households with moderate and severe HHS developed wasting. However, there is no

significant association between wasting and FCS (P-value=0.835). However, stunting has a strong association with both FCS and HHS food security indicators. The association stunting with HHS is significant (P-value<0.001). The association of stunting with FCS is also significant (P-value<0.006). Similarly, the association of underweight with both food security indicators is significant (P-value-0.001 and 0.002).

Health system response to health need of population is another factor contributing to high prevalence of iron deficiency anemia. The result of survey shows that 48.1% women seek ANC services of which only 16.4% received 4 ANC visit. This shows a lower coverage of care during pregnancy. On the other hand the result of survey shows that iron supplementation during the first trimester was 83.3%, and reduced to 6% in the second and 3.5% in the third trimmest. However, iron requirement in the second and trimester is much higher than first trimester. Similarly, only 3.8% of women received drug for intestinal worm during pregnancy. This shows that there is not a standard protocol and the health providers are not well capacitated to provide appropriate micronutrient supplementation services.

6.3 Recommendation:

The following recommendation at the policy level for both the Ministry of Public Health and the stakeholders are provided to improve iron deficiency and anemia among children under five and WRA in Afghanistan.

1. Special focus needs to drawn on the treatment and control of infection. The treatment of diarrhea, ARI, measles and Malaria are part of BPHS that are currently being implemented through health facilities in Afghanistan. It needs to be further improved. Mothers need to be encouraged to give more food to their sick children during and after the diseases. Currently, families not only increase the food, but give their children even less food than usual, which results in malnutrition of their children.
2. In children 2-12 years, the element iron needs to be administered intermittently as continuous iron supplementation sometime causes side effects and long-time iron intake may result in poor compliance of children. In settings where the prevalence of anaemia in preschool or school-age children is 20% or higher, intermittent use of iron supplements is recommended as a public health intervention to improve iron status and reduce the risk of anaemia among

children (strong recommendation)[19].The recommended dose for children 2-5 years is 25mg element iron/week for 3 month following three months of no supplementation after the provision of supplementation restart for one year. The recommended dose for children 5-12 years is 45mg element iron/week with the same method and duration as younger children[17]. If feasible, intermittent supplementation should be given throughout the school or throughout the calendar year. In addition, future studies are encouraged to comprehensively document the effects of intermittent supplementation on anaemia, iron deficiency, hemoglobin, and ferritin concentrations and other indicators of iron status and inflammation.

3. In order to optimize the impact of effectiveness of prevention, MoPH needs to provide iron supplementation for all pregnant and lactating women. Pregnant and lactating women should take iron tablets. The recommended dose for pregnant women is 60mg element iron with 250µg folate twice a day from the second trimester until the end of pregnancy.
4. The MoPH in close collaboration with ministries of agriculture and education need to enhance awareness of population on importance of food intake during pregnancy, lactation and breastfeeding initiation, and importance of food intake by children. MoPH needs to disseminate nutrition messages though health facilities during face to face counseling and group counseling and organize community Compiegne. The Ministry of Eeducation (MoE) needs to promote nutrition messages among school children and through children to their families. The Mministry of Aagriculture needs to focus on food product quality and promote home gardening and food security.
5. To acquire and maintain optimal level of iron storage and hemoglobin concentration, the MoPH in collaboration with the Ministry of Agriculture needs to promote iron fortification with main staple foods such as flour, maize, rice and wheat. These are main staple foods that every Afghan family consumesdaily. MoPH can take the lead to advocate flour fortification with the government and parliament members and promote fortification at the rural area using local wheat products. A mechanism needs to be developed to import only fortified flour from neighboring countries. Promoting knowledge and attitude of households to use fortified flour in their kitchens is needed. The fortification can be in combination of iron with other micronutrients.

6. The ministry of public health needs to expand the coverage of CMAM community mobilization, Supplementary Feeding Program (SFP) and Stabilizations Center to the whole country. This package needs to be integrated within the current BPHS. Shortages of staff is a problem in the BPHS; the MoPH needs to increase one nutrition officer in each health facility to provide nutrition goods and services.
7. All health providers need to be educated in nutrition. Job descriptions of health providers need to be revised and must specify the responsibilities of head of health facilities, nurses, and midwives toward nutrition programs and particularly iron supplementation.

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Annexes:

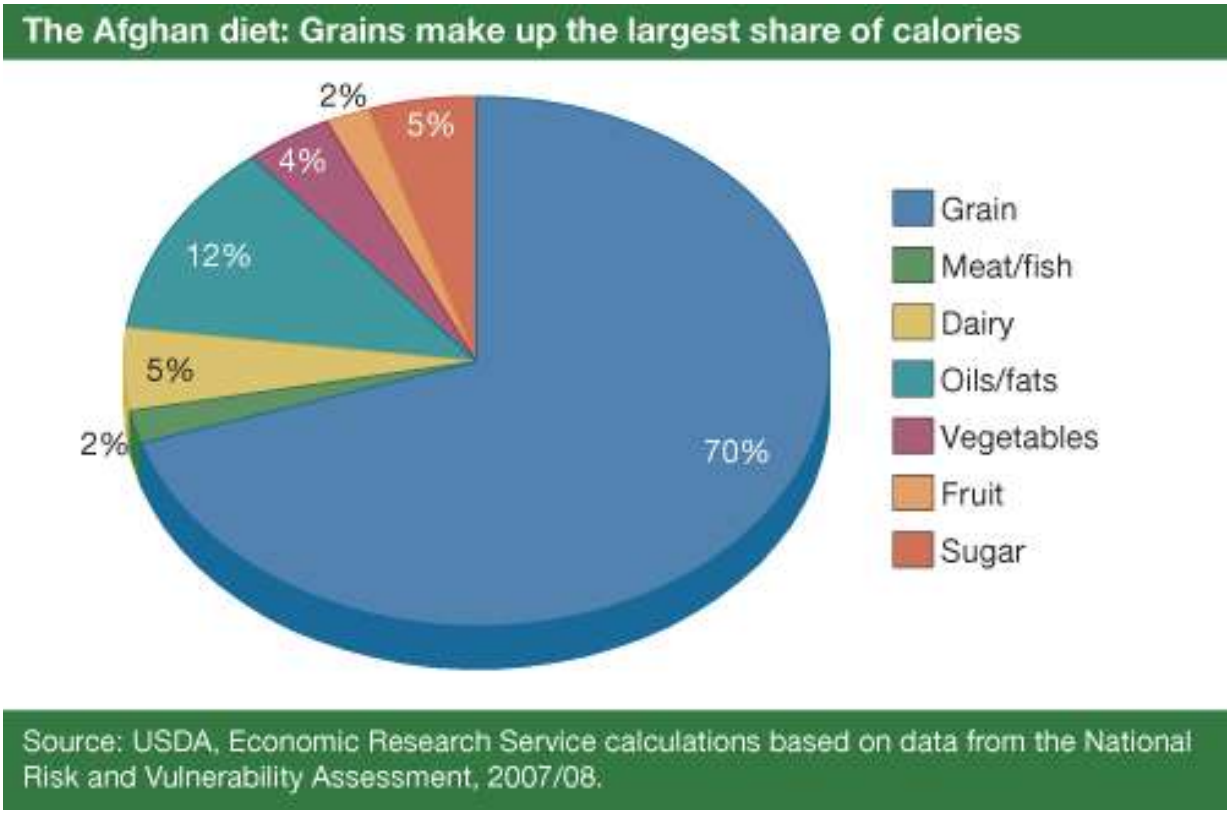
Annex 1: Afghanistan Map:

Annex 2: Key finding of NNS 2013

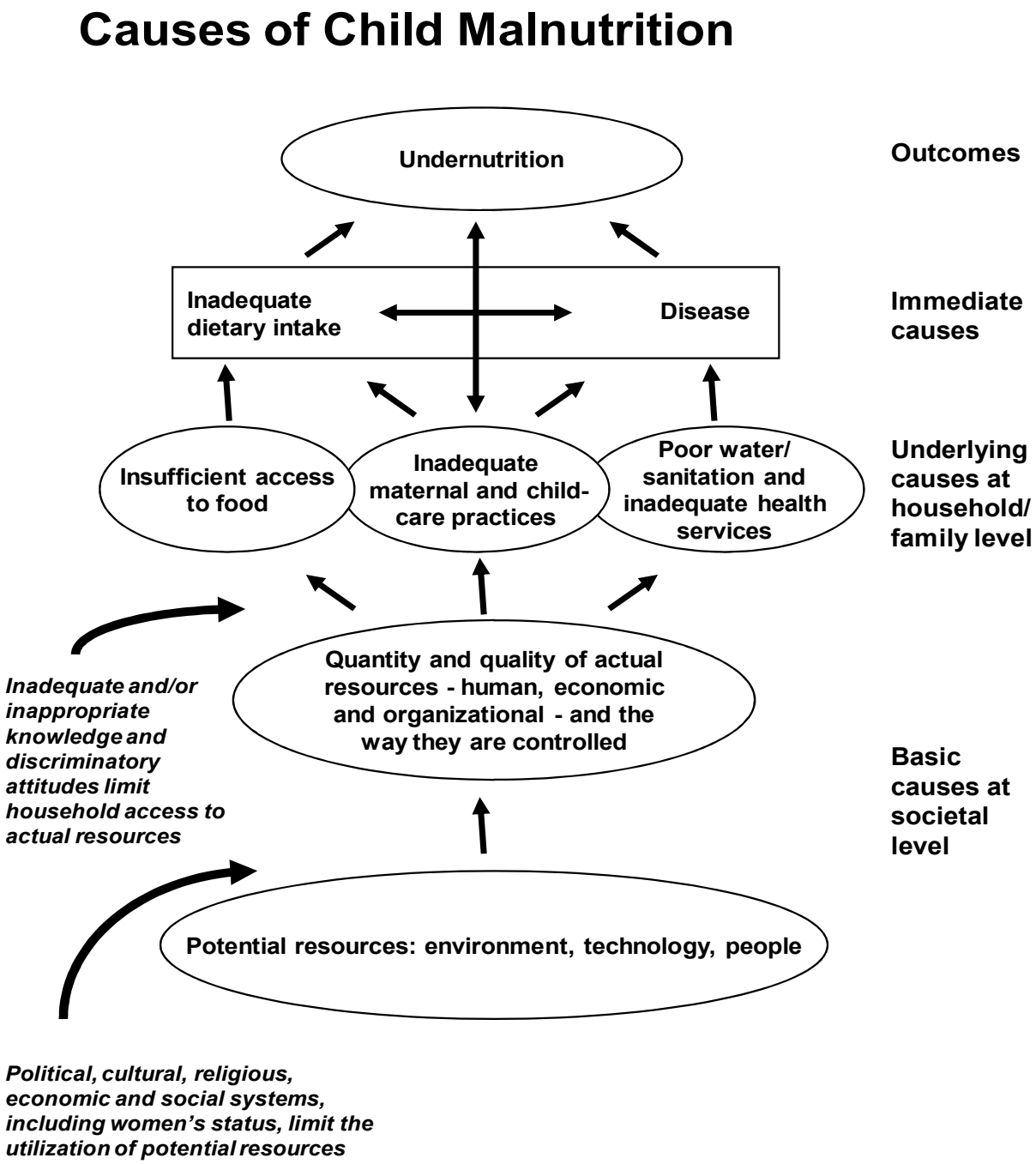
Nutritional Status children 0-59 months	Percentage
Underweight	**Prevalence**
Moderate and Severe (-2 SD)	25.0
Severe (-3 SD)	9.7
Stunting	**Prevalence**
Moderate and Severe (-2 SD)	40.9
Severe (-3 SD)	20.9
Wasting	**Prevalence**
Moderate and Severe (-2 SD)	9.5
Severe (-3 SD)	4.0
IYCF	**Indicators**
Percentage who ever breastfeed	98.0
Percentage who breastfeed within one day of birth (12 hours)	88.9
Percentage who received a pre-lacteal feed	52.4
Percentage who received colostrum	87.5
Exclusive breastfeeding (0-5month children)	58.4
Percentage predominantly breastfeed (0-6 moths)	76.3
Appropriately breastfed (0-23 months)	55.2
Initiation of solid, semi-solid and soft foods (All infants of 6-8 months)	41.3
Initiation of solid, semi-solid & soft foods (6-8 months with current breastfeed)	30.9
Minimum meal frequency (Infants 6-23 months)	52.1
Minimum acceptable diet	12.2
Water and sanitation	
Use of improved drinking water sources	62.9
Water treatment	10.7
Use of improved sanitation facilities	40.4
Maternal and newborn health	
At least once ANC by skilled personnel	48.1
At least four times ANC by skilled personnel	16.4
Content of antenatal care (BP measure, Urine and blood sample taken)	7.4
Skilled attendant at delivery	45.5
Vitamin A Supplementation Vitamin A supplementation (Children under 5 years)	
Vitamin A supplementation (Children under 5 years)	44.6
Micronutrient deficiencies (Women of reproductive age)	
Anemia	40.4
Iron deficiency	24
Iron deficiency anemia	13.8
Vitamin A deficiency	10.8
Vitamin D deficiency	95.3
Zinc deficiency	23.4
Iodine deficiency	40.8
Micronutrient deficiencies (children 0-59 months of age)	
Anemia	44.9
Iron deficiency	26.1
Iron deficiency anemia	13.7
Vitamin A deficiency	45.8
Vitamin D deficiency	81.0
Zinc deficiency	15.1

Iodine deficiency school age children (7-12 years of age)	29.5
Iodized salt utilization	
Reported use of iodized salt for cooking	37.9
Salt with adequate iodine content (Rapid test kit)	71.5

Annex 3: Diet in Afghan that make energy source of population.



Annex 4: Conceptual Framework of Undernutrition, UNICEF 1992



Source: The State of the World's Children 1998

Annex 5: Housing condition:

Housing condition	Number of respondents	Percentage
Owned house	15227	86%
Rented house	764	7.5%
Living without paying	994	5.6%
Living in one room	3844	22.3%
Living in two rooms	6939	39%
Living in three rooms	3474	20.6%
Living in more three rooms	2388	14.7%
Houses with natural floor	10636	55.1%
Houses with rudimentary floor	126	0.9%
Housing with finished floor	6041	40.8%
Houses with natural wall	1646	7.9%
Houses with rudimentary wall	11911	61.1%
Houses with finished wall	3635	30.5
People use solar panel	8684	40.5%
People use connected electricity	4393	39.2%
People with no electricity	2562	12.6%
People using wood as a cooking fuel	3139	26.9%
People using straw/grass as a cooking fuel	6369	29.8%
People using animal dung as a cooking fuel	2919	16.3%