Deanship of Graduate Studies

Al-Quds University

The Nutritional Status and Dietary Pattern of School-aged Children in East Jerusalem 2002/2003

Christine Pierre Bandali Jildeh

M.P.H Thesis

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The Nutritional Status and Dietary Pattern of School-aged Children in East Jerusalem 2002/2003

By

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The Nutritional Status and Dietary Pattern of School-aged Children in East Jerusalem 2002/2003

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Declaration:

I certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed: Christine Jildeh

Christine Pierre Banali Jildeh

Date: 3rd June 2004

DEDICATION

This thesis would not be possible without the loving support of so many people, as a woman usually too full of words, I find myself overwhelmed in offering them all my thanks in dedicating this thesis to them.

The single most formative environment for me, as, I believe, for anyone, was of course my home, which having been and continuing to be a home filled with books proved to be a very stimulating place in which to grow up – our small house always just a step away for whenever the bookishness had to be counterbalanced. To my dad Pierre and Mom Nariman, who are my strength and purpose in life. With the exception of God, nothing is more important. You have gone through a very tough time and carried most of the burden so that I can finish my studies. How do I say it, except: ***"Thank you!"***

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List of Abbreviations

24-h-RQ	24-Hour Recall
BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CSFII	Continuous Survey of Food Intakes of Individuals 1994-1996
DOP	Declaration of Principles
EDHS	The Egyptian Demographic and Health Survey
DOP	Date of Birth
FPNHANS2000	First Palestinian National Health and Nutrition Survey 2000
GS	Gaza Strip
Hb	Hemoglobin
ICH	Immunization and Child Health
IDA	Iron Deficiency Aneamia
IDD	Iodine Deficiency Disorder
IHI	Israeli Health Insurance
IMR	Infant Mortality Rate
MCHC	Mothers and Children Health Care
MMR	Maternity Mortality Rate
MOE	Ministry of Education
MSR	Multi Sector Review
MUFA	Mono Unsaturated Fatty Acid
NGOs	Non-governmental Organizations
ORS	Oral Rehydration Solution
PA	Palestinian Authority
PCBS	Palestinian Central Bureau of Statistics
PHC	Primary Health Care
PLO	Palestinian Liberation Organization
PMOH	Palestinian Ministry of health
PNA	Palestinian National Authority
PUFA	Poly Unsaturated Fatty Acid
RDA	Recommended Dietary Allowance
SD	Standard Deviation

SFA	Saturated Fatty Acid
SPSS	Statistical Program for Social Science
SS	Student Survey
TFR	Total Fertility Rate
UK	United Kingdom
UN	United Nations
UNGA	United Nation General Assembly
UNICEF	United Nation Children Fund
UNRWA	United Nations Relief and Working Agency
UNSCO	United Nations Office of the Special Coordinator in the Occupied Territories
UNSCOP	United Nations Special Committee on Palestine
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAD	Vitamin A Deficiency
WB	West Bank
WFP	World Food Programme
WHO	World Health Organization

ABSTRACT

Objective : To investigate the nutritional status (prevalence of aneamia and malnutrition) and dietary pattern of school aged children in East Jerusalem.

Study Significance : This study is the first comprehensive study ever conducted on school-aged children in East Jerusalem.

Design : Cross-sectional study.

Settings : Schools in East Jerusalem grades 6, 8 and 10 by school ownership.

Subjects : The sample size was 400 students of which 351 had 24-hour dietary recall and 317 had blood tests and 400 had their weight and height measured.

Study Tools : A scale and meter were used to measure the weight and height, 24-hour recall questionnaire and a food intake booklet were used to quantify the dietary intake and Hemocue machine were used for measuring hemoglobin level.

Data Collection : The sample was collected between April 2003-January 2004.

Results : **Anaemia:** The severe form of anaemia (<7 gm/dl) turned out to be not of public health significance among school aged children in East Jerusalem. As for moderate and mild forms of anaemia it was 0.95% and 19% respectively.

BMI: Underweight (cut off value ≤18.5) was 30% for males and 22% for females. Obesity level (cut off value ≥30) was 3.3% among males and 4.8% among females. Furthermore, 27% of those with income ≥ average were underweight.

Macronutrient: Overall East Jerusalem school aged children macronutrient intake was inadequate when compared to < 80% RDA.

Conclusion : Students in East Jerusalem are generally suffering from malnutrition especially from underweight. More attention should be focused on the improvement of their dietary intake.

Source of support : Funding comes from the Al-Quds Nutrition and Health Research Institute (ANAHRI), Al-Quds University.

ملخص

الهدف : دراسة الوضع الغذائي (فقر الدم و سوء التغذية) والنمط الغذائي لطلبة المدارس في شرقي القدس.

ميزات الدراسة : يعتبر هذا البحث الخاص بطلبة المدارس في القدس الشرقية الأول من نوعه.

نوعية الدراسة : تم استخدام أسلوب العينة المسحية.

مجتمع الدراسة : طلبة مدارس في القدس الشرقية إن حجم العينة الكلي 400 طالب. لقد تم سؤال 351 عن سلوكهم الغذائي، وقد تم قياس نسبة الهيموجلوبين في الدم ل 317 طالب. وقد تم قياس الوزن والطول ل 400 طالب.

أدوات الدراسة : تم استخدام ميزان ومتر من أجل قياس الوزن والطول. أما بخصوص قياس كمية الغذاء فقد تم تعبئة استمارة 24 ساعة الماضية إضافة إلى كتيب مقادير الطعام. وتم قياس نسبة الهيموجلوبين في الدم بواسطة جهاز الهميكيو.

جمع العينات : تم جمع عينات الدراسة في الفترة ما بين نيسان 2003- كانون الثاني 2004

النتائج : **أنيميا**: إن الدراسة بينت أنه لا توجد مشكلة خاصة بالأنيميا الحادة (<7gm/dl) لدى طلبة المدارس في القدس الشرقية. إن الأنيميا المتوسطة تشكل 0.95% و الأنيميا البسيطة تشكل 19%.

مؤشر كتلة الجسم: لقياس سوء التغذية تم استخدام المعيار ≥ 18.5 لقياس الطلبة دون الوزن السوي حيث تبين أن 30% من الذكور و 22% من الإناث يعانون من ذلك. 27% من الطلبة ذوي الدخل المعتدل وأعلى يعتبرون دون الوزن السوي. أما المعيار الخاص بالسمنة ≥ 30 فلقد أظهرت النتائج أن 3.3% من الذكور و 4.8% من الإناث يعانون من السمنة.

المكونات الرئيسة للطعام المأكول: بشكل عام إن طلبة المدارس في القدس الشرقية يحصلون على نسبة غير كافية من المكونات الرئيسة للطعام المتناول والتي تشكل < 80% من المخصصات الغذائية الموصى بها.

الخاتمة : بشكل عام إن طلبة المدارس في القدس الشرقية يعانون من سوء في التغذية خاصة دون الوزن السوي. لذا يجب زيادة التركيز على تحسين المخصصات الغذائية.

التمويل المالي : لقد تم تمويل الدراسة من قبل معهد القدس للبحوث الصحية والتغذية في جامعة القدس.

Introduction Chapter (1)

1.1 Introduction

The importance of good nutrition is nothing new. Back in 400 B.C., Hippocrates said, "Let food be your medicine and medicine be your food." Today, good nutrition is more important than ever. At least four of the ten leading causes of death in the world--heart disease, cancer, stroke and diabetes--are directly related to the way people eat; diet is also implicated in scores of other conditions. While the wrong diet can be deadly, eating right is among the key cornerstones of health (www.intelihealth.com, 2002).

Nutrition refers to the processes whereby the living organism receives and utilizes the materials (food) necessary to maintain its functions, and for the growth and renewal of its components. Each nutrient consumed has a specific role to play in the body. Too much, too little, or the absence of any of these nutrients may result in some deficiency or disease. It may also disrupt the functioning of other dependent nutrients (www.gnldglobal.com, 2003).

Well-balanced nutrition, moderate exercise, and sufficient rest go a long way towards achieving health, vitality and longevity in all age groups. Good nutrition does not only supply the body with necessary "fuel". It also provides substances that it can use such as carbohydrates, lipids, sterols, and proteins. While diet is what we eat, nutrition is what our cells and tissues actually receive (www.gnldglobal.com, 2003).

Adolescence is a particularly unique period in life because it is a time of intense physical, psychosocial, and cognitive development. Increased nutritional needs at this juncture relate to the fact that adolescents gain up to 50 per cent of their adult weight, more than 20 per cent of their

adult height, and 50 per cent of their adult skeletal mass during this period (www.who.int/nut/index.htm, 2003).

The world's adolescent population constitutes around 1.2 billion persons aged 10-19, or about 19 per cent of the total population. This age group faces a series of serious nutritional challenges not only affecting their growth and development, but also their livelihood as adults (www.who.int/nut/index.htm, 2003).

Due to worldwide population growth, there are now more school-age children in developing countries than ever before. At the same time, as access to basic education has increased in most of the developing world, there are also more children in schools. However, due to neglect, millions of school-age children remain at risk due to poor health and nutrition (Human Resources Development and Operations Policy, 1993)

Historically, populations affected by conflict are at risk for undernutrition from a variety of factors. These may include poverty, food shortages, epidemics, and insufficient security to allow access to markets. Food security is defined as the ability of a household to feed its members, and depends on the availability of food (the quality and quantity of food supply) as well as the accessibility of food (an individual's entitlement to food through exchange, purchase and claims). Thus, food insecurity and its resultant nutritional deficiencies can occur in locations where there is no overt food shortage. Rather, food insecurity and eventual famine is often the sole result of a large number of people suffering a breakdown in their exchange entitlements such as wage-based labor, production assists, inheritances, subsidies, and the like. The Palestinian Territories represent one such environment (Nutritional Assessment of the West Bank and Gaze Strip, September 2002).

1.2 Problem statement and significance of the study

The Palestinian economic crisis has seriously compromised household welfare. Many families have endured long periods without work or incomes. Despite the various employment efforts of the Palestinian Authority (PA), Non-Government Organizations (NGOs), and other donors, many families now depend on food aid for their daily survival. Coping with the situation has meant selling assets, borrowing from families, neighbors, and shopkeepers, as well as cutting consumption, including consumption of food (World Bank, 2002).

Using a poverty line of US$2.10 per day, the World Bank estimated that 21 percent of the Palestinian population was poor on the eve of the *intifada*. This number increased to about 60 percent by December 2002. Accounting for population growth, the numbers of the poor have tripled, from 637,000 to just less than 2 million. The poor are also getting poorer. In 1998, the average daily income of a poor person was equivalent to US$1.47 per day. This has now slipped to US$1.32. More than 75 per cent of the population of the Gaza Strip is now poor. The high rate of Palestinian population growth, at 4.3 percent per annum, is also fuelling the growth in poverty (West Bank and Gaza update, 2003).

The crisis has affected different social groups differently, and adolescents are particularly vulnerable. Being old enough to understand the economic hardships that their families face, but generally too young and inexperienced to be able to help much, they are particularly susceptible to trauma and to feelings of powerlessness and rage (World Bank, 2002).

After the onset of the *intifada* in September 2000, the Palestinian Ministry of Health (PMOH) and the U.S. Agency for International Development (USAID) West Bank/Gaza Mission had clear evidence that malnutrition, anaemia, and food insecurity were becoming prevalent. This was

caused by the economic degradation and restricted access of the civilian population to goods, services and employment. The Palestinian-Israeli conflict increased in intensity during the spring of 2002. This led to a deterioration of the economic conditions of families in the Jerusalem area, interfered with food availability, and raised the possibility of a significant problem of malnutrition (Nutritional Assessment of the West Bank and Gaze Strip , 2002).

The nutritional status of school-aged children has been of limited concern, and no assessment of dietary intake among school aged children in East Jerusalem has been conducted. Therefore, the aim of this study was to assess dietary intake and nutritional status of school-aged children in East Jerusalem.

School children have fewer infections such as pneumonia (infection of one or both lungs caused by a bacteria, virus, or fungus) and gastroenteritis (inflammation of the stomach and intestines often caused by Salmonella enteritidis) than younger children do, and less chronic disease than ageing people. Thus they have generally been given little health and nutrition attention, except for reproductive health concerns. However, there are adolescent-specific nutritional issues that call for specific strategies and approaches. The main issues that can be assessed in nutrition among school-aged children are:

- Dietary intake
- Micronutrient and macronutrient deficiencies
- Malnutrition, stunting, and under-nutrition
- Overweight and obesity
- Unhealthy eating patterns and lifestyles

The research was implemented on school-aged children in East Jerusalem. The collection of sample will be described later in the methodology chapter. The study included taking anthropometric measurements, drawing blood, and using a 24 hour food recall questionnaire. These tools were able to measure the above-mentioned parameters.

The study also reviewed available literature and studies in order to see where the school children in East Jerusalem stand nutritionally, and to help identify and prioritize the nutritional problems.

1.3 Goal

The aim of this study is to assess the nutritional status of school-aged children in East Jerusalem.

1.4 Objectives

Principal questions to be addressed included:

- What is the prevalence of malnutrition (underweight and obesity) among school-aged children in East Jerusalem using anthropometric measurements?
- What is the prevalence of iron deficiency anaemia among children)?
- What is the dietary pattern for school-aged children as determined by a 24 hour recall?
- What intervention strategies could be implemented to ameliorate the nutritional status of school children?

1.5 Null Hypotheses To Be Tested

The ongoing Israeli-Palestinian conflict has resulted in an increased incidence of malnutrition and anaemia among school-aged children in East Jerusalem, as compared to worldwide norms. The following hypothesis will be tested at level of significance $\alpha = 0.05$.

H_0: *There is no association between anemia type and age groups.*

H_0: *There is no association between anemia types and gender.*

H_0: *There is no association between anemia types and income.*

H_0: *There is no association between BMI and age groups.*

H_0: *There is no association between BMI and gender.*

H_0: *There is no association between BMI and income.*

H_0: *There is no association between anemia types and BMI.*

H_0: *There is no association between energy intake and physical activity.*

The accuracy of these hypotheses in predicting the results of the study will be discussed in a later in chapter 6.

1.6 Assumptions

- A sufficient number of parents will agree on the participation of their children in the conducted research.
- School children will be cooperative during both the 24-H-recall and the measurement of the anthropometric variables.
- The political conditions will be stable in the Jerusalem area during the study and it will not affect the research study.

1.7 Limitations

The limitations of the present research are similar to the limitations of any research of this nature. The most relevant limitations were as follows:

- The needed resources for conducting a larger study was not available.
- The researcher was interested in implementing her study in the West Bank and Gaza Strip, but could not due to the political situation; therefore the study was confined to East Jerusalem.
- The school year ended by mid June, therefore, the data collection was distributed among the last three months in the academic year 2002-2003 and the first three months of the new academic year 2003-2004.
- The researcher required intensive training to get acquainted with the tools used to assess the dietary intake (24-H-RQ), in addition to the fact that the used tools required more time than expected.
- Since a single 24-H-RQ method was used to assess the dietary intake among students, the data collected could not be used to characterize the usual diet of school children.
- The Head Office of the Israeli Municipality schools gave a conditional acceptance to the researcher. She was not allowed to measure the hemoglobin level among school children enrolled in their schools. Therefore, the hemoglobin measured will exclude the number of students registered at the Municipality schools.
- The UNRWA Head Office requested the presence of one of their medical team members to ensure the proper collection of blood samples.
- Although the original plan was to collect 440 sample, and due to time limitation the researcher collected 351 school-aged children. 351 of them went through with the 24-hour dietary recall, and 313 had their hemeaglobin recorded.

Despite the above-mentioned limitations, the analysis of the collected data contributed new and useful information about the topic. The various analysis in the research underlined important and critical aspects about the nutritional status among the school-aged children in East Jerusalem.

1.8 Time Framework

Twenty months were set to complete the study.

DATE	ACTIVITY
Oct.2002-Feb.2003	• Statement of problem. • Identification of the goal, objectives, limitations and assumptions. • Selection of the research design and methodology. • Development of the study tools.
March- April 2003	• Write literature review.
April-June 2003	• Field work (interviews and questionnaire) • Data entry
September2003-January 2004	• Field work (interviews and questionnaire) • Data entry
February-March 2004	• Data cleaning • Data analysis
April-May 2004	• Writing the discussion chapter • Writing the results chapter • Writing the recommendations chapter
June-July 2004	• Proof reading • Discussion

1.9 Definitions and Explanations

Acute malnutrition:

Malnutrition means excessive weight loss, i.e. thinness or wasting. Two indicators can measure this; low weight for height or weight for age. Children whose weight for height or weight for age is below three standard deviations (-3 SD) from the median of the reference population are considered to have acute malnutrition (NCHS/WHO).

Anaemia:

Anaemia by definition is an abnormal decrease in the body's total red blood cell mass. There are several clinical and hematological indicators used to detect anaemia. The most common is serum hemoglobin (Hb). Hemoglobin, a primary component of red blood cells, transports oxygen to tissues of the body and removes carbon dioxide. The production of hemoglobin is dependent on iron. If hemoglobin falls below defined levels based on age and gender, an individual is considered anemic. Therefore one of the primary causes of anaemia is iron deficiency.

Iron deficiency anaemia is the most prevalent of all micronutrient deficiencies, affecting one third of the population worldwide (UNICEF, WHO, 1999). Iron deficiency anaemia develops when there is an inadequate intake of bioavailable dietary iron. Infants, children, and pregnant and lactating women are the population groups most vulnerable due to their increased dietary requirements for growth and reproduction. The functional consequences of iron deficiency are reduced tolerance to exercise, growth retardation and impaired mental development.

Anthropometry:

Anthropometry is the technique that deals with the measurement of size, weight, and proportions of the human body. The anthropometric measurements described here are standing height and

weight, in relation to the age and gender of the child and in accordance with the guidelines developed by the CDC and recommended by the WHO.

Chronic malnutrition:

Low height for age is considered an indicator of chronic malnutrition (shortness or stunting), which is frequently associated with poor overall economic conditions and/or repeated exposure to adverse conditions. Children whose height for age is below (-1 SD) from the median of the reference population are considered to have chronic malnutrition (NCHS/WHO).

Degrees of malnutrition:

Severe malnutrition: -6 z scores to –3 z scores

Moderate malnutrition: more than -3 z scores to – 2 z scores

Mild malnutrition: more than -2 z scores to – 1 z scores.

(NCHS/WHO)

Health status:

Health status is defined as the overall well being of a specified individual, group, or population (PCBS 2002).

Height:

Distance from the crown of the head to the sole while the child is measured standing.

Height for age (stunting):

This index provides an indicator of linear growth retardation. Children whose height for age is below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age, or stunted. Children who are below –3 SD from the reference

population are considered severely stunted. Stunting of a child's growth may be the result of a failure to receive adequate nutrition over a long period of time, or of the effect of recurrent or chronic illness. Height for age therefore represents a measure of the outcome of malnutrition in a population over a long period and does not vary appreciably with the season of data collection (NCHS/WHO).

Macronutrients:

Nutrients required in the greatest amount; e.g. carbohydrates, protein, fats (Medical Dictionary Search engine, 2004).

Malnutrition:

The term malnutrition is used to cover a multiplicity of disorders, ranging from deficiencies of specific micronutrients, such as vitamins and minerals to gross starvation or (at the other extreme) obesity. This discussion is largely limited to protein and calorie malnutrition, which is manifested primarily by retardation of physical growth in terms of height and weight (NCHS/WHO).

Micronutrients:

Essential dietary elements required only in small quantities. They are present in the body in amounts less than 0.005% of body weight (Medical Dictionary Search engine, 2004).

Mild anaemia:

This corresponds to the level of hemoglobin concentration of 10-10.9 g/dl for children and 10-10.9g/dl for pregnant women and 10-11.9 g/dl for not pregnant women (NCHS/WHO).

Moderate anaemia:

This corresponds to the level of hemoglobin concentration of 7-9.9 g/dl for children and pregnant and non-pregnant women (NCHS/WHO).

Nutritional status:

It measures and allows us to describe the current status of the child, both in terms of immediate acute factors such as inadequate current intake of food, childhood disease and diarrhea leading to wasting, as well as accumulated impact of chronic deprivation leading to stunting.

Severe anaemia:

This corresponds to the level of hemoglobin concentration of less than 7 g/dl for children and women both pregnant and not pregnant (NCHS/WHO).

Weight:

Measurement of a child's total body mass.

Weight for age:

This is a composite of the index of height for age and weight for height. Children whose weight for age measures below minus two standard deviations (-2 SD) from the median of the reference population are underweight for their age, while those whose measures are below –3 SD from the median of the reference population are severely underweight. A child can be underweight for his age, because he is stunted, because he is wasted, or because he is both stunted and wasted (NCHS/WHO).

Weight for height (wasting):

This index measures body mass in relation to body height. Children whose weight for height is below minus two standard deviations (-2 SD) from the median of the reference population are too

thin for their height, or wasted, while those whose measures are below –3SD from the median of the reference population are severely wasted. Wasting represents the failure to receive adequate nutrition during the period immediately before the survey. It may be the result of recent episodes of illness or acute food shortages (NCHS/WHO).

Z scores:

Deviation of Values of height and weight of the surveyed population compared to the reference population (NCHS/WHO).

Background Chapter (2)

2-1 Historical Introduction

"Palestine" is a geographic designation dating back to ancient times. Under the long rule of the Ottomans, Palestine was an integral part of Greater Syria (Bilad ash-Sham). This region also encompassed present-day Syria, Lebanon and Jordan, but was never a single administrative entity (Heacock R., 2004).

By the early 20th century, the Ottoman Empire had weakened and. The Europeans were spreading their grip throughout the eastern Mediterranean, including Palestine. Therefore, Palestine was becoming a trouble spot of competing territorial claims and political interests (MERIP, 2000).

In 1916, Zionist leaders requested from the British authorities the approval for creating a Jewish settlement in Palestine. In 1917, British Foreign Secretary Arthur Balfour declared British support for the establishment of land for a "national home" for the Jewish people. This became known as the Balfour Declaration. (Willson B., 2002).

Since then, many political events have affected the health, educational and economic aspects of life. For more information please refer to references mentioned below[1].

[1] Jerusalem Bulletin, 2002; Palestine Facts, 2003; www. Encarta.com, Encyclopedia 2004; B'tselem, 2004; and Dumper M., 1997.

Graph 1: West Bank and Gaza Strip districts according to the Israeli Administration after 1967

2-3 Population and Demography

Palestine comprises two areas that are separated geographically: the West Bank (which includes east Jerusalem) and the Gaza Strip. The West Bank lies within an area of 5,800 sq. Km^2 west of the river Jordan. It and East Jerusalem have been under Israeli military occupation since June 1967.

The West Bank is divided into four geographical regions. The North includes the districts of Nablus, Jenin and Tulkarem. The Center comprises the district of Ramallah and Jerusalem. The South is made up of the Bethlehem and Hebron districts. Lastly is the sparsely populated Jordan valley including Jericho.

The Gaza Strip is a narrow piece of land lying on the coast of the Mediterranean Sea. It has an area of 360 sq. Km^2 and is a densely populated. The population is mainly concentrated in the cities, small village, and eight refugee camps that contain two thirds of the population (PCBS annual report 2002).

According to PCBS report for the year 2002, the total Palestinian population in the world was 9,209,773. Only 3,464,550 are located in the Occupied Territories, with a proportion of 37.6 per cent of the total Palestinian population in the world. The population of the Gaza Strip was 1,261,909 million, or 36.4% of the total population in Palestine and 13.7% of the total population in the world. The West Bank contained 2,202,641 million (63.6%) of the total population in Palestine, and 23.9% of the total Palestinian population in the world.

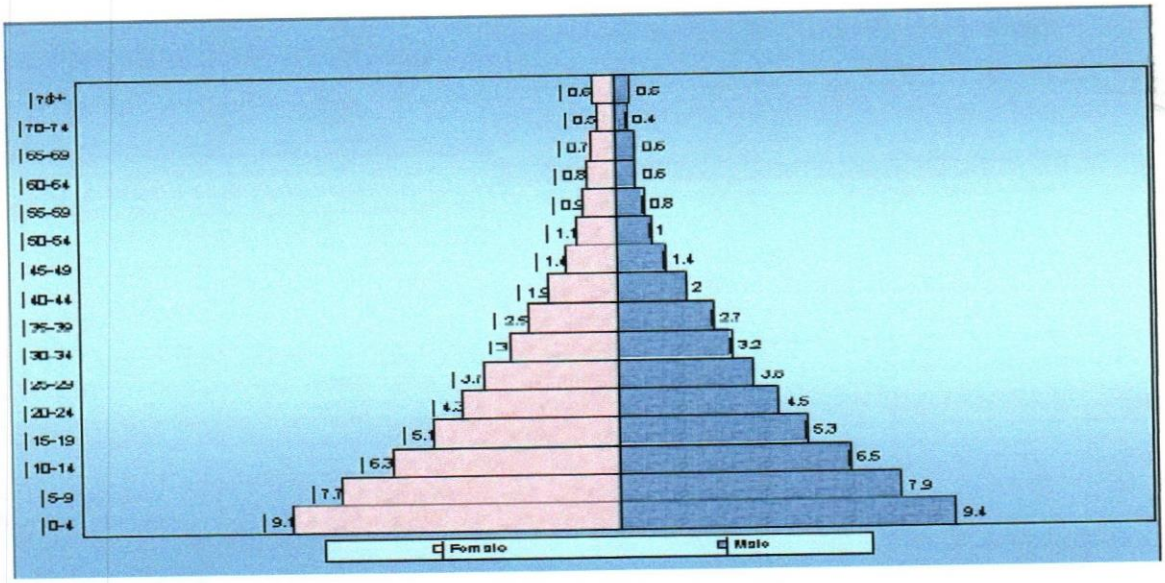
2-3-1 Age and gender distribution

Due to differing health needs, the differential patterns of health care utilization, and the different health status among the various age group, age distribution is considered important for its implications on health status.

Graph 2 represents the Palestinian population pyramid. The age group under five represents 18.1 per cent of the total population (19.4% in the GS and 17.3% in the WB). The age group under fifteen represents 49.4 per cent of the total population (49.6% in the GS and 44.3% in the WB). The ages 60 years and over constitutes 4.6 per cent of the population (3.9% in the GS and 5.0% in the WB). Palestinian who are 56 and above represent 3.2 per cent of the total population.

The Male to female ratio in the Palestinian population for the year 2002 was 102.2 (106.2 in the GS and 102.4 in the WB). Up to the age 45-49 years there is gender predominance towards males, then above the age of fifty gender is more predominant towards females (PCBS annual report 2002).

Graph (2): Distribution of Population by age group and gender, Palestine, 2002



2-3-2 Dependency Ratio

Dependency ration is a measure of the portion of a population which is composed of dependents (people who are too young or too old to work). The dependency ratio is equal to the number of individuals aged below 15 or above 64 divided by the number of individuals aged 15 to 64, expressed as a percentage.

In 2003, the WHO registered the dependency ratio for Palestine at 98%, which was the highest ratio when compared to other neighboring countries. Lebanon 53%, Jordan 70%, Egypt 70% and Syria 78% (WHO, 2003).

2-3-3 Population growth

The declining mortality rate and the increase in the fertility rate would lead to high natural population growth in Palestine. Although the growth rate declined from 3.8 per cent in 1997 to 3.6 per cent in 2000, it increased in the year 2002 to reach 3.7 per cent (PCBS annual report 2002).

2-3-4 Population Density

The Gaza Strip, physically isolated from the rest of the Palestine, has a large number of people in a small land area, with 3,505 inhabitants per one square kilometer. 380 people occupy one square kilometers in the West Bank area (PCBS annual report 2002).

2-3-5 Distribution by refugee status

As a consequence of the 1948 and 1967 wars, two out of five persons in the occupied territories are UNRWA refugees or descendants of UNRWA refugees. According to the United Nation Relief and Work Agency (UNRWA) report in 2002 the total number of refugees is 1,532,589.

considers its control of education as legitimate. The Palestinians, on the other hand, reject the annexation and consider this city an occupied city since 1967. They consider that East Jerusalem belongs to them. Since East Jerusalem is inhabited primarily by Palestinians, it is legitimate that Palestinians have jurisdiction over how their children are educated (Multi sector review-Education 2002).

School education in East Jerusalem is conducted through four supervising authorities, namely, *Awkaf*/Government, UNRWA, Private, and Israeli Municipality.

2.4.1 Awkaf Schools:

Since 1994, the Palestinian Ministry of Education (MOE) has been managing and following up on the implementation of the Jordanian curricula in West Bank schools and the Egyptian curricula in Gaza Strip in Awkaf/Government schools. Simultaneously, it has been developing the first Palestinian curriculum, which seeks to meet the needs and aspirations of the Palestinian people. As the first Palestinian curriculum is being implemented gradually, all schools in the West Bank, Gaza Strip and East Jerusalem will be teaching this curriculum (Multi sector review-Education 2002).

2.4.2 UNRWA Schools:

UNRWA schools have their own centralized system and have their own particular educational orientation. The UNRWA Education Department takes into consideration the overall vision and goals set by the MOE. In spite of that, the Palestinian Ministry of Education does not have an official direct influence over East Jerusalem schools (Multi sector review-Education 2002).

2.4.3 Private Schools:

Private schools are not controlled directly by Israel. Some of them are missionary in nature while others are for profit. As a result, generations of students are graduating from schools with different cognitive and national orientations. In addition, many of these private schools have their own affiliations or work independently, and do not cooperate and coordinate with each other academically or educationally (Multi sector review-Education 2002).

2.4.4 Municipality Schools:

When the State of Israel was founded in 1948, a fully functioning education system already existed, developed and maintained by the pre-state Jewish community, with Hebrew (which had been revived for daily speech at the end of the 19th century) as the language of instruction. In 1981 the Israeli government approved using the Jordanian curriculum by Municipality schools in East Jerusalem and it was implemented in all the education school cycles (Israeli Ministry of Foreign affairs, April 2003).

As noticed above, there is no one official body to coordinate these schools and supervise them directly within an overall Palestinian educational vision. Each of these supervising authorities implements their own rules and regulations and have their own structures.

Table (1) shows the distribution of students, classes, schools and teachers in school education in East Jerusalem 1999-2000. It indicates that the distribution of students, classes and schools among the four supervising authorities is highest in municipality schools (students 55.7 per cent, classes, 53.0 per cent and schools 37.6 per cent). This is followed consecutively by private schools (students 22.4 per cent, classes 25.5per cent and schools 31.2 per cent),

Awkaf/Government schools (students 16.3 per cent, classes 16.5 per cent and schools 23.6 per cent) and UNRWA schools (students 5.6 per cent, classes 5.0 per cent and schools 7.5 per cent).

Although contributing least to the number of students, classes and schools in East Jerusalem, UNRWA schools have the most crowded classes with an average class size of 34.0 and a student to teacher ratio of 30.3, followed by Municipality schools (average class size 32.2; student to teacher ratio unavailable because of the inability to secure the number of teachers because of the economic burden) and Awkaf/Government schools (average class size of 30.3 and student to teacher ratio of 22.5). Private schools are the least crowded with an average class size of 26.8 and student to teacher ratio of 18.0.

Table 1: Distribution of students, classes, schools and teachers in school education in East Jerusalem 1999-2000

		Supervising Authority								Grand Total	
		Awkaf/ Government		UNRWA		Private		Municipality			
		No.	%	No.	%	No.	%	No.	%	No.	%
Students	M	1,894	23.6	967	35.1	6,289	57.0	NA	-	-	-
	F	6,148	76.4	1,786	64.9	4,742	43,0	NA	-	-	-
	T	8,042	100.0	2,753	100.0	11,031	100,0	22,438	-	49,264	-
Per cent of grand total		8,042	16.3	2,753	5.6	11,031	22.4	22,438	55.7	49,26	100.0
Classes	M	53	20	26	32.1	163	39.7	NA	-	-	-
	F	176	66.	51	63.0	144	35.0	NA	-	-	-
	Co	36	13.6	4	4.9	10	25.3	NA	-	-	-
	T	265	100.0	81	100.0	411	100.0	852	-	1,609	-
Per cent of grand total		265	16.5	81	5.0	411	25.5	852	53.0	1,609	100.0
Schools	M	6	27.3	3	42.9	10	34.5	NA	-	-	-
	F	12	54.5	3	42.9	7	24.1	NA	-	-	-
	Co	4	18.2	1	14.2	12	41.4	NA	-	-	-
	T	22	100.0	7	100.0	29	100.0	35	-	93	-
Per cent of grand total		22	23.6	7	7.5	29	31.2	35	37.6	93	100.0
Teachers	M	87	24.4	31	34.1	225	36.8	NA	-	-	-
	F	270	75.6	60	65.9	387	63.2	NA	-	-	-
	T	357	100.0	91.0	100.0	612	100.0	NA	-	-	-
Per cent of grand total		-	-	-	-	-	-	-	-	-	-
Average class size		30.3		34.0		26.8		32.2		30.6	
Student teacher ratio		22.5		30.3		18.0		-		-	

2-5 Health status in Palestine

The Palestinian population in general and those in East Jerusalem in particular enjoy good health indicators since they are covered by the Israeli National Health Insurance Scheme (ICDC, 2002). For more details about the health status, please refer to the references mentioned below[2].

[2] ICDC report, 2002; PCBS, 2002.

Literature Review Chapter (3)

3.1 Introduction

This chapter will explain the relationship between the current research topic and aims with recent literature in the field. It will also familiarize the reader with what has already been written on the topic under study. It will be based on reviews and discussion papers on adolescents. The following literature will also show where my study will fit in the relevant and existing body of knowledge.

In a review and discussion paper done by the World Health Organization (WHO) for the year 2001, the WHO showed that the developing countries include 85% of the adolescents[3] in the world which is approximately 20% of the total population (Wang Y., et al, 1998). This age group is relatively healthy compared to other age groups. Adolescents have a low prevalence of infection compared with under-five children, and of chronic disease compared with ageing people. And although adolescents are having serious nutritional challenges affecting their growth and development and their livelihood as adults, they have generally been given little health and nutrition attention, except for reproductive health concerns (WHO, 2001).

Taking care of adolescence will provide the opportunity to prepare nutritionally for a healthy adult life. Some nutritional problems that occurred during childhood can potentially be corrected, in addition to tackling current ones (WHO, 2001). Therefore, for a wide reasons related to the rapid physical and emotional development during this period, adolescence represents a period of peak concern (Wang Y., et al, 1998).

[3] WHO has defined « adolescents » as people in the 10-19 years age range, and « youth », as those between 15 and 24 years of age.

3.2 Prominent nutrition issues in adolescence

During adolescence phase, children go through a period of intense physiological, psychological, and social change. During this transitional period, children gain 20% and 50% of their adult height and weight, respectively (Mahan and Escott-Stup, 1996). The transition from childhood to adulthood occupies a crucial position in the life of human beings. This period is characterized by an exceptionally rapid rate of growth (Anand K., et al, 1999). It may also extend over inconsistent periods of time, depending upon socio-cultural and economic factors. Taking into consideration the wide variations in development, maturity and lifestyle among adolescents (WHO, 2001).

The main health indicator used to assess the health status among a population by health planners has been mortality rate. Adolescents have the lowest mortality among the different age groups therefore they have received low priority. However, recent studies proved that the prevalence of malnutrition and anaemia is high in these age groups (Anand K., et al, 1999).

A majority of the adolescents under study assumed that they are in good health, and showed little concern for protecting their health for the future. Nonetheless, caution is needed before generalizing problems and approaches. The main nutritional problems of adolescents are micronutrient deficiencies that are especially needed for child growth such as Vitamin A and Zinc, iron deficiency anaemia in particular, and depending on the context, under-nutrition or obesity (Cordonnier D., 1995).

Poor nutrition in any age group is usually the result of dietary inadequacies, often combined with unhealthy lifestyles or infections, which further compromise nutritional status. Because of erratic eating patterns and specific psycho-social factors combined with the particularly high nutritional

requirements for rapid growth, dietary inadequacies are likely more of a threat among adolescents (WHO, 2001).

The following sets of issues will be discussed: dietary intake, micronutrient deficiencies; malnutrition, under-nutrition and stunting; Overweight and obesity and adolescents' eating patterns and lifestyles.

3.2.1 Micronutrient deficiencies

Micronutrients are essential dietary elements required by the body in small quantities, they are provided by the diet and represent less than 0.005% of body weight (Medical Dictionary Search engine, 2004). Micronutrients are essential for the body in order to maintain its normal functions. Without them, the body can not function optimally and different health problems occur. The absence of these micronutrient during growth period affect the development of basic biological functions like intellect, and even life itself, can be threatened.

Micronutrient deficiencies are common in many developing countries and are typically due to inadequate food intake, poor dietary quality, poor bioavailability, and/or presence of infections (Ramakrishnana U., 2002).

All vitamins and most minerals are micronutrients. The three major micronutrient deficiencies emphasized by the WHO world-wide are: Iodine, iron deficiencies and vitamin A. An estimated 60 million school-aged children suffer from iodine deficiency disorders (IDD) and 210 million from iron deficiency anaemia (IDA). Generally pre- schoolers are at highest risk of the most severe effects of vitamin A deficiency (VAD), namely blindness and death. Nevertheless, vitamin A deficiency does not disappear, and because of it an estimated 85 million school-aged children

are at higher risk for acute respiratory and other infections (WHO, 2001). Iron deficiency anaemia is the most prevalent of all micronutrient deficiencies, affecting one third of the population worldwide (UNICEF, WHO, 1999).

Although all micronutrients are of importance to the humans regardless of their age, this study will tackle the three main deficiencies: iron deficiency, Vitamin A and Iodine deficiency.

Iron deficiency is defined as an abnormal decrease in the body's total red blood cell mass. There are several clinical and hematological indicators used to detect anaemia, the most common being serum hemoglobin (Hb). Hemoglobin, a primary component of red blood cells, transports oxygen to tissues of the body and removes carbon dioxide. The production of hemoglobin is dependent on iron, if hemoglobin falls below defined levels based on age and gender, an individual is considered anemic. Therefore one of the primary causes of anaemia is iron deficiency (PCBS, 2000).

"A child is born with a high level of hemoglobin, in general it is more than 15 g/dl, and it starts to decrease slowly during the child's first months of age, reaching 9 g/dl by the time the child is 3 months old. This levels then start to increase back gradually, to the point that when the child is 1 year old it is normal that it has reached 12 g/dl or more. After adolescence, a normal value for a boy is 13 g/dl and for a girl it is approximately 1 g/dl lower" (Jimenez E., 2004).

The WHO estimated that about 40% of the world's population (more than 2 billion individuals) suffer from anaemia. The groups with highest prevalence are: pregnant women and elderly about 50%; infants and children 1-2 years, 48%; school children, 40%; non pregnant women, 35%; Adolescents, 30-35%; and preschool children, 25% (WHO, 2000). This study showed that the

prevalence of anaemia in developing countries is four times of developed countries with Asia having the highest rate in the world.

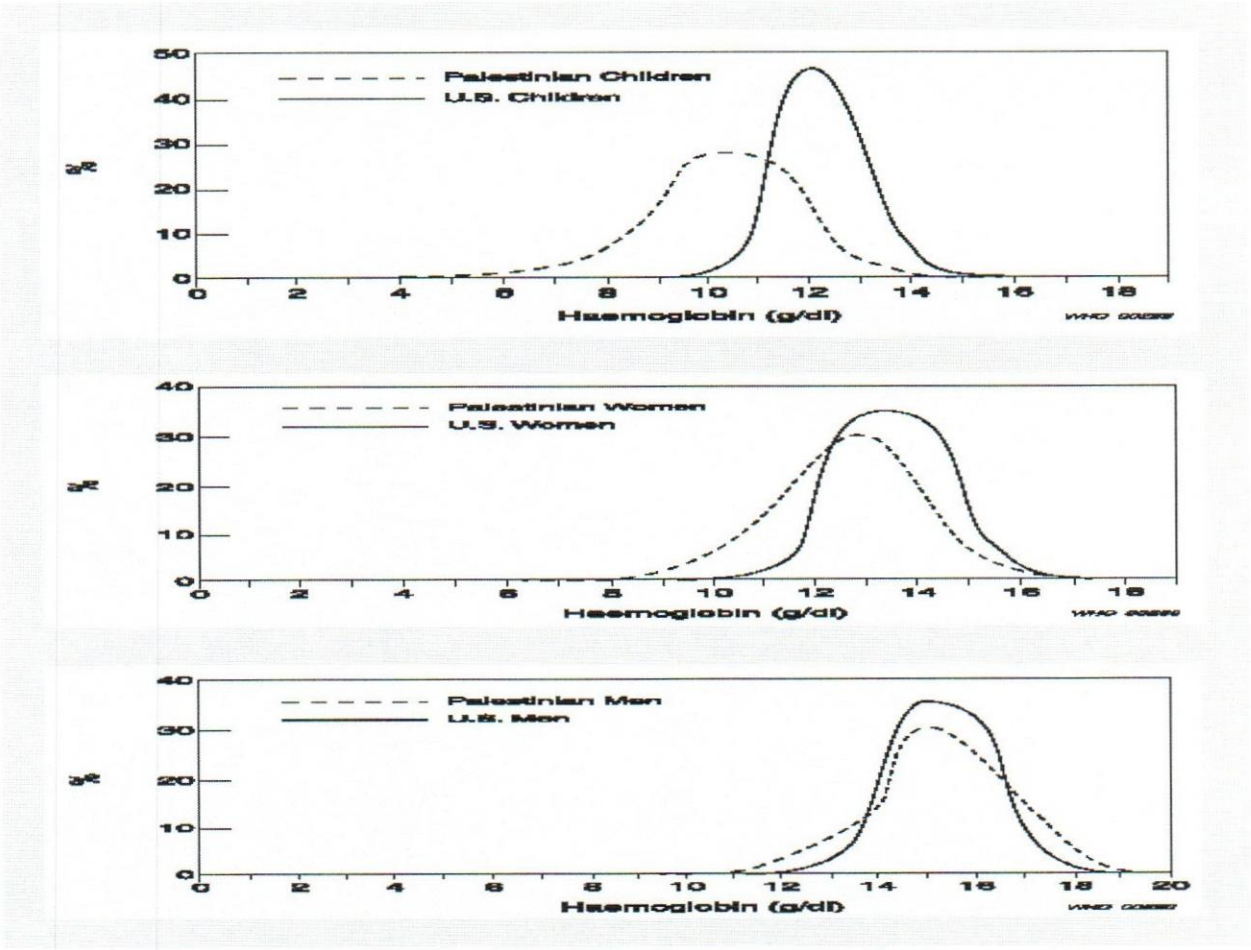
In a study based on rapid nutritional surveys in the Southern Region of Oman, it was shown that iron deficiency anaemia is still one of the main nutritional problems among young children and adolescent girls in Oman. The study showed that anaemia was found to be 38% among school children (Musaiger A., 2001).

In October 2003, a study to assess the anaemia among school children in the West Bank took place. The study was implemented in Ramallah and Jerusalem areas. The overall prevalence of anaemia among the two areas was 14% for children in grade 3, 7 and 10. In Jerusalem area, there were no severe cases when compared with Ramallah area (5.4%), but the overall prevalence for children in grades 3, 7 and 10 were similar in both districts (Abdeen Z., et al , 2003).

A good approach used to compare haemoglobin distribution among children, women and men is when you compare the population the study population with non anaemic reference population.

Graph 4 shows a comparison of haemoglobin distribution among Palestinian refugee population where iron deficiency was the sole cause of anaemia with US reference distribution (WHO, 2002)

Graph4: Haemoglobin Distribution in Palestinian Vs US Children, Women and Men.



Vitamin A is an essential nutrient needed in small amounts for growth and development, the normal functioning of the visual system, maintenance of epithelial cellular integrity, immune functions and reproduction (Kapil U., et al 2002). It happens due to inadequate intake of its preformed form (from breast milk and animal fats), and its precursors (carotenes) (Viteri F., et al, 2002).

Generally pre-schoolers are at highest risk of the most severe effects of vitamin A deficiency, namely blindness and death. Nevertheless, vitamin A deficiency does not disappear, and because of it an estimated 85 million school-aged children are at higher risk for acute respiratory and other infections (WHO, 2001).

There are two estimates of the prevalence on Vitamin A deficiency: the first one done by the WHO-MDIS which indicated that as of the year 1995 there were 28 million children under the age of 5 with clinical VAD, and 251 million with subclinical VAD (WHO, 1995). In 2001, Mason et al., estimated the number at 3.3 million with clinical VAD, and 75-140 million subclinical VAD (Mason J., et al., 2001). Part of the differences between the two estimations was due to lack of reliable representative data (Ramakrishnana U., 2002). In Palestine, a study conducted in 2003 by the MOH in collaboration with MARAM project has shown that the prevalence of VAD is 22% amongst school children aged 6 – 8years. There is no data available on adolescents yet.

VAD remains a very severe health problem which affects more than 60 countries, large proportion of them live in Southeast Asia, followed by Africa and the Americas (Ramakrishnana U., 2002).

Iodine unlike other nutrients is not found in specific foods. It is present in the soil and it is ingested through foods grown in that soil as well as salt. Iodine deficiency results from inadequate content of iodine in earth's crust.

Iodine deficiency is also quite prevalent. More than 2 billion persons in the world are estimated to be at risk of this deficiency (ACC/SCN, 2000). Healthy humans require iodine, it is an essential component of the thyroid hormones thyroxine and trioddthronine. Inadequate amount of iodine leads to insufficient production of these hormones, which affects many parts in the body particularly muscles, heart, liver, kidney and the developing brain (Kapil U., 2002). The most devastating damage is for those affecting the developing human brain (Tiwari BK., et al., 1998).

Iodine deficiency during early pregnancy is the major cause of mental retardation worldwide, with overt cretinism affecting more than 3 million children most of them in developing countries (WHO, 1999).

In Palestine, a national iodine deficiency survey was conducted in the West Bank and Gaza in 1997. The prevalence of goiter among primary school students within the age of 8-10 years was also studied. The results showed that the overall prevalence rate of goiter was 14.9% amongst school children. According to the prevalence rate the overall classification of iodine deficiency in the West Bank and Gaza strip was labeled to be mild, according to the laboratory indicator (concentration of urinary iodine) it was also mild (Abdeen Z., 1997).

At the country level, it is obvious that several countries have more than one micronutrient deficiency. Although there has been much interest in multiple micronutrient deficiency lately, little is known about the magnitude and significance of this problem (Ramakrishnan U., et al., 2001).

3.2.2 Malnutrition, stunting and undernutrition

The term malnutrition is used to cover a multiplicity of disorders, ranging from deficiencies of specific micronutrients, such as vitamins and minerals to gross starvation or (at the other extreme) obesity (NCHS/WHO).

Height for age is as an index used to study chronic malnutrition known as stunting. This index express the height of a child in relation to his age in addition to comparing his height with reference population for the same age (NCHS/WHO).

Quds University, chronic and acute malnutrition is widespread among children under five years and increasing rapidly, 30% of children screened suffered from chronic malnutrition and 21% from acute malnutrition. These numbers have increased significantly since 2000 when only 7.5% and 2.5% of children suffered from chronic and acute malnutrition respectively (AQU/JHU, CARE, 2002).

A study done in Iraq in 2000 by the FAO, showed that the prevalence of low BMI among school children aged 9-15 ranged from 16-18% in three governorates, a level that is 3-4 times that of the reference population. These results were supportive to findings from school children surveys in Baghdad (FAO, 2000).

3.2.3. Overweight and Obesity

Obesity and overweight are conditions in which weight gain (predominantly fat) has reached the point of endangering health. The prevalence of overweight and obesity has increased rapidly over the past two decades in the developed world and it has been described by the World Health Organization as 'a global epidemic' (WHO 1998). There is still very little data on obesity world-wide, particularly in developing countries.

Only patchy data are available on obesity in adolescence. Since existing information is sufficient to show that obesity is increasing everywhere, and in all age groups, obesity should be monitored world-wide (Wang Y., 1998). Obesity at adolescence is an issue because it tends to persist in adulthood (Serdula MK., et al., 1993) and the longer its duration, the higher the associated mortality and morbidity (Must A., et al., 1992).

In countries undergoing rapid urbanisation and economic growth, nutrition transition is observed, with a rise in obesity and other nutrition-related chronic diseases. In China, for instance, overweight is only emerging, but it is a problem associated with urban living, high income, and adolescence (Wang Y., 1998).

Since 1980 the prevalence of obesity has nearly trebled in the UK and is continuing to increase. When combining the overweight and obese groups nearly two thirds of men and over half of women were either overweight or obese in 2001 (Joint Health Surveys Unit, 2002).

Jebb et al., 2003 in his survey among British young people found out that overweight prevalence among children aged 4-18 years has increased to 15.4% and that 4% of the young people surveyed were obese. The study also showed inequalities in the prevalence of overweight and obesity also exist in children, with higher rates among Asian groups, lower social classes and children living in Wales and Scotland (Jebb et al., 2003).

Obesity imposes a heavy health and social burden, and it is widely recognized that treatment is not only costly, but remarkably ineffective, therefore prevention is now crucial. Adolescents should be a priority target, even in developing countries, particularly in urban settings because of conducive eating patterns and lifestyles. An additional reason is that obesity programmes appear more successful in adolescents than adults, as suggested in a few studies (Gortmaker SL., et al., 1993).

3.2.4 Adolescents' eating patterns and lifestyles

When there are no major economic or food security constraints, food choices are primarily determined by psycho-social factors. Personal preferences take precedence over eating habits learned at home as adolescents progressively take control of what they eat, where and how.

Therefore, eating patterns are frequently erratic among adolescents, and this may be a common factor of nutritional risk irrespective of the area. (Sheperd R., 1996).

Usually adolescents bear certain features which affects their dietary patterns such as searching for their identity; struggle for independence and acceptance; concern about appearance; vulnerability to commercial and peer pressure; and limited concern for health (Spear B., 1996). Girls may be more exposed than boys to inadequate intakes because of dieting, lower energy intake, social discrimination, and pregnancy (Dennison CM., 1995).

Adolescents in industrialized countries have some common dietary patterns such as: snacking, usually on energy-dense foods; meal skipping, particularly breakfast, or irregular meals; wide use of fast food (Cavadini C., et al. 1999, US Dept Health and Human Services, 1989). These eating disturbances and disorders in industrialized countries have become a leading chronic illness among adolescent girls such as Anorexia and bulimia (Fisher M., 1995). Even Europe, adolescents have some of theses dietary disorders such as: low consumption of fruits and vegetables, and of dairy products in some instances; faulty dieting practices in girls; and unconventional dietary practices (Cavadini C., et al. 1999, US, Dept Health and Human Services, 1989).

Although little information is available about eating patterns in developing countries, but it is known that cities in particular, have some of the above mentioned eating patterns. A study that took place in Nepal, among school children revealed that fast food (ready to eat snacks, chips...) were preferred by more than two-thirds of adolescents, and that advertising influenced preferences in 80% of them (Sharma I., 1998). Adolescents may be seen as 'early adopters' of new products

or ideas, if we consider the overwhelming influence that the medias have upon them (Strasburger VC., et al., 1999). All this makes adolescents an ideal target for nutrition education.

Since body image is important in adolescence, it is related with obesity, dietary disorders, and psychological discontent (Heinberg LJ., et al. 1996). Many theories have been proposed to explain this relationship, but because of the data availability, the socio-cultural factor theory was best supported (Heinberg LJ, et al. 1996). As part of nutrition promotion and obesity prevention, it is therefore important to develop a positive body image and self-esteem among adolescents.

It was noted that healthy eating and other healthy behaviors are oftentimes strongly related, and that conversely drinking, smoking, lack of physical activity, overeating, and poor dietary choices tend to cluster (Milligan RAK., et. al, 1997, Delisle H., et al, no date mentioned on the report).

It was observed that physical activity in high income society tends to fall during adolescence (Dinger MK., et al. 1997), and girls are less active than boys (Robinson TN., et al. 1995). Upon observations in Malawi in 1998, adolescent boys and girls in poorer societies of developing countries, may be expected to engage in heavy physical work many hours a day (Fazio-Tirrozzo G., et al., 1998). Poor access to food as a result of poverty may further exacerbate the gap between food energy requirements and intake of adolescents. However, no gender difference in dietary adequacy was observed in adolescents (Kurz KM., 1994).

As noticed there is contrasting adolescent nutrition problems, on one hand, household food security needs to be improved for adolescents to have more adequate diets, and on the other, a higher level of physical energy expenditure is required in combination with healthier eating.

with great care. A stunted girl is likely to become a stunted adolescent and later a stunted woman. Apart from direct effects on her health and productivity, adult stunting and underweight increase the chance that her children will be born with low birth weight. And so the cycle turns.

4.3.1 Underlying Causes

4.3.1.1 Household food security

Household food security depends on access at all times to enough food for active and healthy children. It can be measured by the following indicators:

- Food consumption data
- Anthropometric measures (e.g. height and weight)
- Clinical assessment of nutritional deficiencies

In general, access to food may be influenced by the following:

- Intra-household distribution of food
- Infant feeding practices
- Stable local food supply

4.3.1.2 Care of Mother and Child

The UNICEF framework places great emphasis on the care aspects of women and children. These factors will be briefly mentioned.

4.3.1.2 a Care for women and related aspects

The food security of children is closely linked with the health, nutritional status, education, and economic well-being of their mothers. Each year that a girl stays in school makes it more likely that she will have children later in life, and that her children will be healthier. Healthy, educated mothers with economic resources are better able to appropriately feed and care for their children. There are several factors that are thought to impact adversely on the care of women and children such as:

- Women Workload and time constraints
- Access to information

- Schooling and education
- Decision-making

4.3.1.2.b Breastfeeding and child feeding practices

These practices include:

- Exclusive breastfeeding
- Timely introduction of complementary foods
- Breastfeeding into the second year
- Adequate complementary feeding
- Adequate micronutrient intake
- Frequent feeding
- Food serving practices influence the amount of food eaten

4.3.1.2.c Adoption of and adaptation to the family diet

Some considerations include:

- Intra-household distribution
- Disability

4.3.1.3 Environmental Health, Hygiene and Sanitation

This underlying cause includes the usage of:

- Toilet facilities
- Safe, clean water

4.3.2 Basic Causes

The three underlying factors require resources of three main types, namely human, economic and institutional:

4.3.2.1 Human resources

These include:

- *Knowledge and schooling:* The educational state of the caregiver is a vital element in the battle against malnutrition. It improves their awareness and provides guidance about the importance of diet, health and hygiene. In addition, it gives them the chance to gain skills to earn a decent living.
- *Physical health and nutritional status of the caregiver:* The caregiver's nutritional status is extremely important. Malnutrition and under-nutrition among caregivers often results in poor provision of care for their children, which in turn affects the children's nutritional status and health.
- *Presence of the father:* The characteristics of the father also influence the child's nutritional health status. However, the exact impact can vary greatly. Some studies show that the presence of the father is beneficial for their children in terms of educational and economic achievement and psychological well-being. The father's presence also reduces the burden of employed wives. On the other hand, other studies show that there may be a negative impact. For example, when income is spent on non-food items such as cigarettes, or when food is distributed unequally among family members, the child's nutritional health may be compromised.

4.3.2.2 Economic resources

These include:

- *Employment Status:* Employment status is a critical economic indicator in determining the situation within a given country. The World Bank estimated the unemployment rate in the West Bank and Gaza Strip in December 2001 as 35%. By June 2002, UNSCO estimated the unemployment rate at 50%. By March 2003, there had been a further rise in

unemployment to 53%. This creates an economic crisis leading to a dramatic deterioration of living and health conditions.

- *Income level:* Income level influences the health conditions of the society in general and the individual in particular. For example, any decrease in the family income may contribute to a decline in nutrition among children. Income level also determines the quantity and quality of the food purchased. By March 2002, almost half of Palestinian households were living on 50% of what their income had been before the current *Intifada* began. The World Bank estimates that even if there were a political solution to the ongoing conflict and a lifting of the closures, it would take the Palestinian economy at least two years to recover to a pre-*Intifada* per-capita income level.
- *Poverty Level:* The devastation of the Palestinian economy has had direct repercussions on the impoverishment of the individual. There has been a continuous increase in the rate of people living below the poverty line, defined as a household with two adults and four children with an annual consumption of less than $2.10 per person per day. In January 2001, the number of people living below the poverty line increased from 21% to 32% of the population. By July 2001, this had increased to 65% of the total population – 57% in the West Bank and 80% in the Gaza Strip.

The United Nations World Food Program (WFP) reported that the situation in the West Bank and Gaza Strip is alarming, with hunger and malnutrition increasing. At present, 81.2% of households are in need of assistance.

- *Housing (and immediate environment):* The type of housing that children live in directly and indirectly influence their health status. Housing should include factors which improve hygiene and sanitation of the household. For example, an adequate water supply and

sewage disposal must be installed. Room density may also play a role with respect to overcrowding and the burden on household resources.

- *Control of resources:* The presence of the father or older male relative will influence decision-making at the household level. Traditionally, decision-making with respect to use of money resides with the male head of the household. As a consequence the mother may have little say over food bought for young children.
- *Workload and time available:* Women in general have a large workload. If they are employed, it usually means that the younger children have to be cared for by someone else. Therefore, attention and time for feeding of young children may be compromised.

4.3.2.3 Institutional resources

These include:

- *Alternate caregivers:* In households where the mother is employed, an older sibling or elderly relative (such as a grandmother) often looks after the infant in the mother's absence. It has been shown that infants who are cared for by older children may have a compromised nutritional status. On the other hand, elderly caregivers may find the task of looking after small children to be beyond the scope of their physical ability.
- *Community support:* Good community resources are known to have a beneficial effect on the nutritional status of young children. Preschool facilities, which cater to children's needs during the absence of a working mother, as well as feeding programs targeted at young children, provide additional nutritional support. This also extends to the availability of Baby-Friendly hospitals, which promote and support exclusive breast-feeding in the first 4–6 months of life.

Methodology Chapter (5)

5.1 Introduction

This chapter will describe the research study design. It will describe the target population and sampling procedure. A thorough description will be given regarding the instruments used in measurements. It will also describe how the data was analyzed, and how data quality management was implemented.

Methodology

5.2 Study Design

The study included a randomly selected sample from the four school ownerships in East Jerusalem (PA Schools, UNRWA schools, Israeli Municipality schools and Private schools). A cross-sectional type of study was adopted to implement this study.

5.3 Study Location

The research study took place in schools situated in East Jerusalem.

5.4 Age groups

In 1997/1998 the World Health Organization (WHO) adopted a research protocol in selecting school children under study and discussed the importance of drawing samples using WHO standards. These standards were implemented in this research. Three age groups of young people were sampled, with a year between each pair. The time periods were designed to represent the onset of adolescence (age 11), the challenge of physical and emotional changes (age 13), and the middle years when very important life and career decisions are beginning to be made (age 15).

5.5 Sampling Size

The planned sample was 440 students stratified randomly according to school ownerships. Private Schools (120 students, 1:1, gender ratio), Palestinian Authority Schools (120 students, 1:1, gender ratio), Municipality Schools (120 students, 1:1, gender ratio) and UNRWA School (since the UNRWA schools does not have 10th grade, 80 randomly selected students where chosen, 1:1, gender ratio) (see appendix 1 -sampling protocol). Due to time limitation the sample was collected as follows:

School Ownership	Males	Females	Total
Private Schools			
6th grade	20	20	40
8th grade	20	20	40
10th grade	20	18	39
Total	**60**	**58**	**118**
Israeli Municipality			
6th grade	9	10	19
8th grade	0	4	4
10th grade	5	10	15
Total	**14**	**24**	**38**
Palestinian Authority (PA) Schools			
6th grade	20	20	40
8th grade	19	20	39
10th grade	20	20	40
Total	**59**	**60**	**119**
UNRWA Schools			
6th grade	20	17	37
8th grade	20	19	39
Total	**40**	**36**	**76**
Grand Total	**211**	**189**	**351**

5.6 Selection of Sample

Official letters were sent to the four school ownerships informing them of the researcher's intention to implement the study and requesting their approval. Lists of the schools under their supervision were also requested from them. Upon receiving the school lists, names of school were entered on the computer for random selection.

Introductory visits to the selected schools were made. The researcher delivered the approval letter and distributed the letter of content to be signed by the students' parents. After several days, these letters were collected and names of students were entered on the computer to be randomly selected.

Prior to the interview, children were asked verbally if they agreed to go on with the interview, and the hemoglobin test and interview began. The children's response rate was 100%.

5.7 Gender Distribution

To avoid a gender bias the sample was divided equally between males and females (1 :1, gender ratio).

5.8 Tools

The instruments used in the survey were developed and tested for reliability and validity during the First Palestinian National Health and Nutrition Survey in 2000 (FPNHANS2000).

5.8.1 Anthropometric Study

The following variables were collected:

- *Age*: Children aged 11,13 and 15 were included in the survey.

- *DOB:* Date of birth (DOB) for children was recorded.
- *Gender:* Gender was recorded as male or female.
- *Weight:* Children were weighed using TANITA digital scale (model 1582). The capacity of the scales for adults was 136 kg, with 0.1kg graduations. They were weighed in their clothes, but without shoes.
- *Height:* Children were measured standing with their feet flat on the base, heels, buttocks, shoulders, and back of the head touching the wall. The child's head was positioned so that they were looking directly ahead.
- *Household income:* Poverty level defined in the Jerusalem area, based on income for a family of two adults and four children, is US$ 4 per person per day. The poverty cut-off used was NIS 3500 per month, or roughly US$ 4 per person (for a family of six persons), given a currency exchange rate of NIS 4.9 Per US dollars.
- *Parental education:* Categories included parents who were either illiterate (unable to read or write) or had some level of education. "Primary" refers to any time spent in primary school, "Secondary" to any time spent in secondary school, and so on. "Diploma" includes those who finished their secondary education but have not had any college or university courses. "College or above" includes those with any college courses as well as those with bachelor's or advanced degrees.

The following commonly used nutritional indices were defined and determined as follows:

- **Body Mass Index**

The children's nutritional status was evaluated by calculating their Body Mass Index, or BMI, to determine underweight and overweight. BMI is the relationship between weight (in kg) by the square of the height (in m), or (wt/ht^2).

As children grow, their proportion of body fat changes. Thus, the interpretation of BMI depends on the child's age. Referencing the WHO, the researcher used the following cutoff values to identify underweight and overweight in children (table 2).

Table 2: WHO Body Mass Index cutoff values (wt/ht^2)

BMI					
Severe	**Moderate**	**Marginal**	**Normal**	**Overweight**	**Obese**
< 16	**16-16.9**	**17-18.4**	**18.5-24.9**	**25-29.9**	**≥30**

BMI decreases during the preschool years, and then increases into adulthood. The percentile curves show this pattern of growth.

- **Hemoglobin level**

Anaemia reflects a decrease in the oxygen carrying capacity of the blood due to a decrease in the mass of red blood cells. Hemoglobin, the oxygen-carrying protein in red blood cells, is the most useful indicator of anaemia for testing children. Iron, folic acid, and dietary protein are necessary for hemoglobin and red blood cell production.

Iron deficiency in particular is the leading cause of anaemia worldwide. Thus, malnutrition or inadequate nutrition can lead to anaemia and subsequent impaired learning and growth development among children. It also leads to fatigue and diminished physical and mental productivity, as well as decreased immunity from infectious diseases at all ages.

Hemoglobin level measurements were determined using finger prick technique. Blood analysis was conducted through Hemocue machine (Hemocue AB, Angelholm, Sweden), an instrument

field tested by USAID funded Demographic and Health Surveys worldwide. The following WHO values for anaemia were adopted for children (Table 3).

Table 3: WHO Anaemia cutoff values

	Anaemia in Children			
	Severe	Moderate	Mild	Normal
Hb level (gm/dl)	**<7**	**7 – 9.9**	**10 - 11.9**	**≥12**

The researcher took the measurements. Each photometer was calibrated at the start of the assessment, and controls were checked at the beginning of each data collection day.

5.8.2 24-Hour Dietary Recall

The measurement of dietary intakes of individuals and groups is central to nutrition research. Dietary assessment methodologies may be broadly classified into two categories: those for the measurement of the intakes of groups or households, and those for the assessment of individual intakes. Under the former are techniques such as the food procurement and household inventory method. Individual dietary assessment methodologies include the diet history, 24-hour recall (24-H-RQ), weighed and estimated food records, and food frequency questionnaires. For the purposes of this survey, the 24-hour recall was used.

The 24-hour recall questionnaire for this study was adopted from the USDA survey criteria. It was translated into Arabic and tested for reliability and validity by a pilot test prior to the FPNHANS2000. Categorized questions were included in the questionnaire. They were administered in the classroom and all respondents were guaranteed anonymity.

One of the principal advantages of the 24-H-RQ is its speed and ease of administration. Another major advantage of the 24-H-RQ method is the fact that literacy of the respondent is not required. The researcher was responsible for administering and filling in the responses, which only required verbal answers from the respondent. There was little burden on the respondent, as the interview generally took about 20-45 minutes. Additionally, the immediacy of the recall period meant that respondents were usually able to recall most of their dietary intake of the previous day. Because the recalls took place after the food has been consumed, it meant that the assessment method did not interfere with dietary behavior.

When interviews took place at the student's home, student would get back to their mothers to request some information about the way they cooked and what ingredients were used for preparation, they would also ask them to remind them if they forgot anything. In some cases, students would go to the refrigerator to check the ingredients of the food consumed.

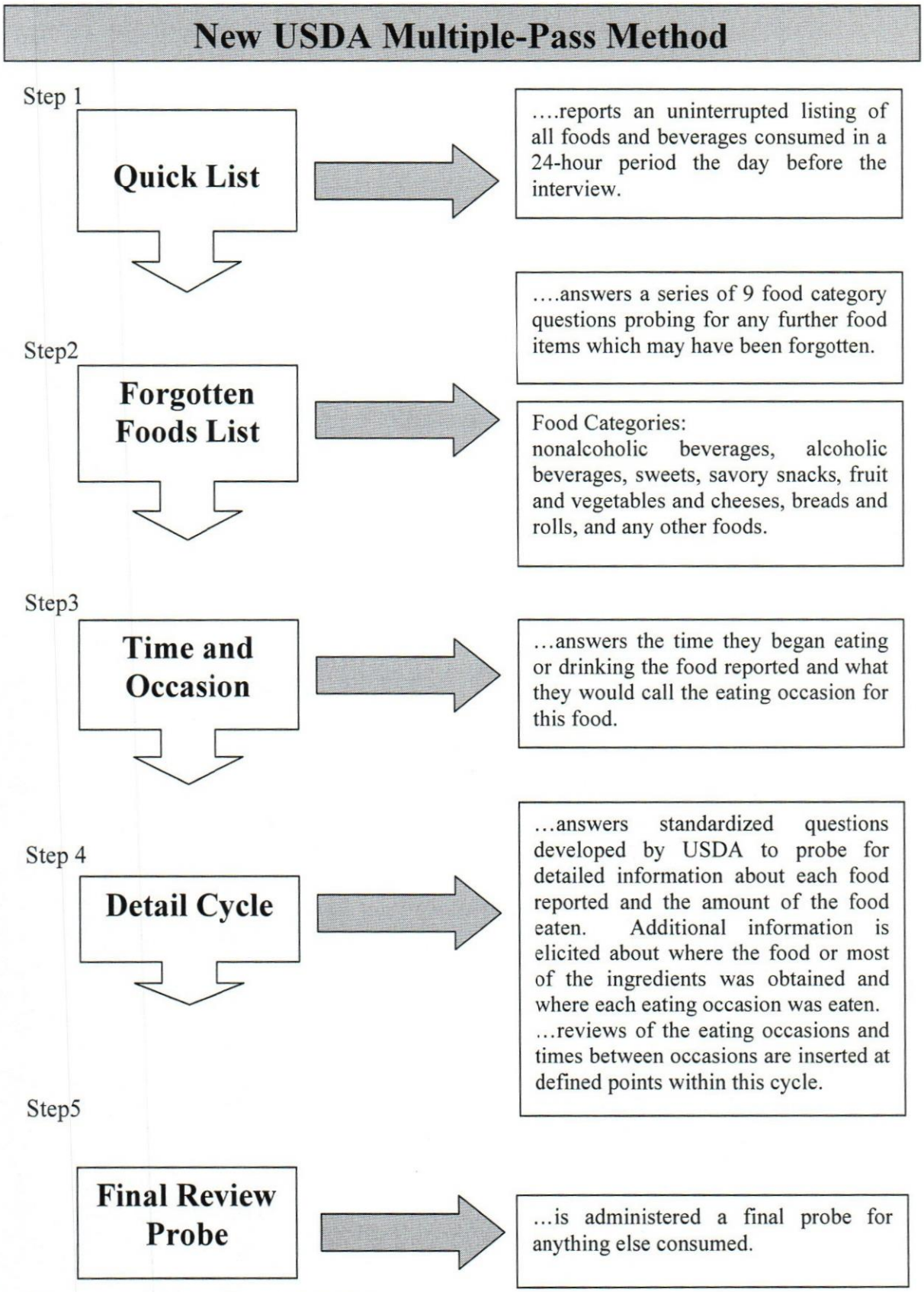
The principal limitation of the 24-H-RQ is that the data from a single 24-H-RQ cannot necessarily be used to characterize the usual diet of an individual. The main use of the single 24-H-RQ was to describe the average dietary intake of school children.

This methodology is based on that which the United States Department of Agriculture (USDA) used in their Continuing Survey of Food Intakes of Individuals 1994-96 (CSFII). This methodology was further developed and modified specifically to include the Palestinian diet by Al-Quds University during the First Palestinian National Health and Nutrition Survey in 2000 (FPNHANS2000) (Annex 3).

Specific procedures were used when using the 24-H-RQ method in order to ensure the collection of representative results in the survey. These included:

- The 24-hour recall questionnaire was conducted in a quiet relaxed atmosphere.
- Although respondents signed a consent form, they were not given advance warning of the specific interview date (in order not to change dietary intake)
- Dietary aids, which assist in identifying portion sizes, were used

Diagram 3: New USDA Multiple-Pass Method



Memory cues throughout interview:

Time	Place	Activity	Eating occasion	People

5.9 Data Collection and entry

The survey data was collected in both schools and homes of respondents, and was entered by the researcher. The interviews were distributed equally among the weekdays given the time frame scheduled for data collection shown in chapter one.

5.10 Data Processing and Analysis

Demographic data processing was carried out using the EPI-INFO 6.04 software program, and the analysis was carried out using the Statistical Program for Social Sciences (SPSS) Version 10.0.5 for Windows 2000. Graphical representations of the data were formed in 'Microsoft Excel'. The 24hr diet recall questionnaires were processed using the SurvNet Composition Database (Annex 3). In order to determine the statistical significance, the probability level used was <0.05.

5.11 Implementation of the Survey

The survey was implemented between April 2003 and January 2004. The researcher followed the same procedure at every school or home included in the survey.

Essentially, the researcher visited each randomly selected school or home and the subject was interviewed according to the following procedure:

- The researcher introduced herself and explained the purpose of the survey.
- The interviewee was reassured regarding the confidentiality of the data and requested to answer the questions truthfully.
- An informed written consent was obtained from the school ownership and parents; verbal consent was obtained from the students prior to interview (Annex 1).
- The questionnaire (Socio-demographic, 24 hour recall, and physical activity) was completed (Annex 2).
- The anthropometric assessment and hemoglobin measurement of the student were taken.

5.12 Ethical Consideration

The study methodology strictly followed prevailing ethical principles for research and was approved by the Human Research Ethics Committee at Al-Quds University.

5.13 Quality Control of Data

Quality control of the data was of primary concern to the researcher. In order to minimize errors and delays in data processing, the survey was implemented using the following procedures that resolved most inconsistencies in the data before they reached the data analysis stage.

5.13.1 Questionnaire Format

Several features of the questionnaire helped to minimize researcher error. For example, all of the questions were written out exactly as they were to be asked. Moreover, suggested questions for further probing were printed on the questionnaire for consumption items. These features reduced the conceptual skills required of the researcher, and also saved time, as the researcher did not have to pause to consider how to phrase each question or how to follow the skip pattern. Lastly, almost all potential responses to each question were marked on the questionnaire with a numbered code, and the researcher wrote only the response code on the questionnaire.

5.13.2 Data Management

The researcher used a personal computer in the field, where all the stages of data collection, data entry, and editing were carried out. This dramatically reduced the length of time between the end of the fieldwork and the availability of the data for analysis. It also improved the quality of the data. The data entry program that was used for the survey has been custom-designed to suit such surveys. This was a major innovation at the time of the First Palestinian National Health and Nutrition Survey in 2000 (FPNHANS2000).

As the data was keyed in, it was submitted to a set of range and validity checks. Numeric variables were constrained to lie between minimum and maximum values, qualitative variables were defined as valid codes, and chronological variables contained valid dates.

5.13.3 Resulting Data Quality

When all of these procedures were scrupulously followed, data quality was very high. These data sets were subjected to data entry checks and corrections in the field as explained above; in addition they were subjected to further "cleaning".

5.13.4 Turnaround Times

The assessment study was noted for the short turnaround time between the end of data collection and the availability of data for analysis. This speed has contributed markedly to the relevance of the data to the current nutritional status. The quick turnaround between the completion of fieldwork and the availability of data for analysis was largely due to the pre-coding in the questionnaire, the extensive quality control during the fieldwork, and the concurrent data entry.

5.13.5 Validity and Reliability

Tools used in this research were a major innovation at the time of the First Palestinian National Health and Nutrition Survey in 2000 (FPNHANS2000). They were pilot tested for validity and reliability prior to the survey.

Results & Discussion Chapter (6)

6.1 Introduction

The purpose of this chapter is to point out the results of the study. It will show the prevalence of anaemia and the distribution of BMI among the different school grades by gender and school ownership. It will also give an overview of the food items consumed by school-aged children, and the daily intake of different macronutrients. This chapter will show where school aged children in East Jerusalem stand nutritionally in comparison with other school aged children in different countries.

6.2 Analysis of Anaemia

6.2.1 Prevalence of Anaemia

Iron demands increase during adolescence due to the growth spurt which results in expanding blood volume and increasing muscle mass. In males, a physiological increase in haemoglobin concentration (HB) is observed. In females, the onset of menstruation occurs. Both these factors add to nutritional requirements (Dallman PR., 1992). A high prevalence of depleted iron stores in adolescence has been reported in affluent societies (Milman N., 1996). These findings raise the question of whether the diets of many teenagers are insufficient to cover iron demands during puberty. However, lack of iron stores may also be merely a transient, physiological state during the growth spurt. National differences in iron status have been suggested to be caused by lower intake and/or lower bioavilability of dietary iron in Nordic countries compared with countries in central Europe (Hallberg L., et al 1989), but the health impact of such differences has not been sufficiently investigated.

In this study, the WHO classification criteria for anaemia degree shown in chapter five (Table 3) were used. Table 4 & graph 5 show anaemia levels for school-aged children of the 11-12 years,

13-14 years, and 15-16 age groups. A total of 313 children were tested for anaemia, since the municipality schools did not grant permission for blood testing. The mild form of anaemia is more prevalent (19.2%) than moderate anaemia (1.0%), which together contributed to 20.2% of school-aged children in the population studied. The severe form of anaemia (<7 gm/dl) turned out to be not of public health significance among school-aged children in East Jerusalem.

Table 4: Prevalence of anaemia in children
Percentage of children aged 11-12, 13-14 and 15-16 years classified as having anaemia, by background characteristics of school-aged children in East Jerusalem, 2002/2003

Background Characteristics	Percentage of children with anaemia				
	Any anaemia (Moderate + Mild)	Moderate 7-9.9 gm/dl	Mild 10-11.9 gm/dl	Normal ≥12 gm/dl	Total
Age groups					
11-12 years	24.5 [n=27]	1.8{66.7}(0.6)[n=2]	22.7{41.7}(8.0)[25]	75.5{33.2}(26.5)[83]	100.00(35.1)[110]
13-14 years	14.5 [n=16]	0.0{}0.0}(0)[0]	14.5{26.7}(5.1)[16]	85.5{37.6}(30.0)[94]	100.00(35.1)[110]
15-16 years	21.5 [n=22]	1.1{33.3}(0.3)[3]	20.4{31.7}(6.1)[19]	78.5{29.2}(23.3)[73]	100.00(29.7)[93]
Total		{100.0}(1.0)[3]	{100.0}(19.2)[60]	{100.0} (79.9)[250]	(100.00)[313]
Gender					
Male	16.7 [n=25]	0.6{33.3}(0.3)[1]	15.1{40.0}(7.7)[24]	84.3{53.6}(42.8)[134]	100.00(50.8)[159]
Female	24.7 [n=38]	1.3{66.7}(0.6)[2]	23.4{60.0}(11.5)[36]	75.3{46.4}(37.1)[116]	100.00(49.2)[154]
Total		{100.0}(1.0)[3]	{100.0}(19.2)[60]	{100.0}(79.9)[250]	(100.00)[313]
Income					
Below Average	31.2 [n=5]	0.0{0.0}(0.0)[0]	31.2{8.3}(1.6)[5]	68.8{4.4}(3.5)[11]	100.00(5.1)[16]
Average	23.9 [n=22]	0.0{0.0}(0.0)[0]	23.9{36.7}(7.0)[22]	76.1{28.0}(22.4)[70]	1.00(29.4)[92]
Above average	17.6 [n=36]	1.5{100.0}(1.0)[3]	16.1{55.0}(10.5)[33]	82.4{67.6}(54.0)[169]	1.00(65.5)[205]
		{100.0}(1.0)[3]	{100.0}(19.2)[60]	{100.0} (79.9)[250]	(100.00)[313]

- *The first number indicates the prevalence of BMI within Age Groups or gender or income or anaemia*
- *The second number indicates the prevalence of Age Groups or gender or income within BMI { }*
- *The third number indicates joint prevalence ( )*
- *The fourth number indicates Counts [ ]*

6.2.1.a Age Group

In table 4 we measure the prevalence and association of anemia among different age groups.

A. The overall prevalence of moderate and mild anemia is 1.0% & 19.2% respectively while the ratio of students with normal HB level is 79.9%.

B. The sample proportion of age groups 11-12, 13-14, and 15-16, are 35.1%, 35.1%, and 29.7%, respectively.

C. The prevalence of moderate and mild anaemia within the age group 11-12 was found to be 1.8% & 22.7% respectively while the ratio of students with normal HB level was 75.5%.

D. The prevalence of moderate and mild anaemia within the age group 13-14 was found to be 0.0% & 14.5% respectively while the ratio of students with normal HB level was 85.5%.

E. The prevalence of moderate and mild anaemia within the age group 15-16 was found to be 1.1% & 20.4% respectively while the ratio of students with normal HB level was 78.5%.

F. The prevalence of moderate anaemia within the age groups 11-12, 13-14, and 15-16 are 66.7%, 0.0%, and 33.3% respectively.

G. The prevalence of mild anaemia within the age groups 11-12, 13-14, and 15-16, are 41.7%, 26.7%, and 31.7% respectively.

H. The prevalence of students with normal HB level within the age groups 11-12, 13-14, and 15-16, are 33.2%, 37.6%, and 29.2% respectively.

I. The joint prevalence between the age group 11-12 and moderate & mild anaemia is 0.6%, & 8.0% while it is 26.5% for students with normal HB level.

J. The joint prevalence between the age group 13-14 and moderate & mild anaemia is 0.0% & 5.1% respectively while it is 30.0% for students with normal HB level.

K. The joint prevalence between the age group 15-16 and moderate & mild anaemia is 0.3% & 6.1% respectively while it is 23.3% for students with normal HB level.

Let us now test the null hypothesis:

H_0 **: There is no association between anemia type and age groups at level of significance** $\alpha = 0.05$ **.**

Table 5: Chi-square Value, Phi Measure of Association and P-value: Anemia and Age

Statistic	Chi-Square	Phi	P-Value
Value	4.666	0.122	0.323

As shown in table 5 the asymptotic-significance = p-value = probability value =0.323 is greater than the level of significance $\alpha = 0.05$, therefore we do not reject H_0 at $\alpha = 0.05$ and conclude that the anemia type and age groups are independent. That is, the results are not statistically significant. Furthermore, we can say that the smallest level of significance (or the observed α) to reject H_0 is 0.323.

The Phi measure of strong association between the anemia type and age group was calculated and is $\phi = 0.122$ with p-value=0.323. This also shows that the association between anemia type and age groups is not significant.

Conclusion: From the above discussion we conclude that there is no association between the anemia type and the age groups.

6.2.1.b Gender

In table 4 we measure the prevalence of anemia among gender, and study whether the two characteristics (anemia and gender) contain tend to be associated with each other.

A. The sample proportion of males and females are 50.8% and 49.2%, respectively.
B. The prevalence of moderate and mild anaemia within males was found to be 0.6% and 15.1% respectively, while the ratio of students with normal HB level was 84.3%.
C. The prevalence of moderate and mild anaemia within females was found to be 1.3% & 23.4% respectively while the ratio of students with normal HB level was 75.3%.

D. The prevalence of moderate anemia within male and female students is 33.3% and 66.7%, respectively.

E. The prevalence of mild anemia within male and female students is 40.0% and 60.0%, respectively.

F. The prevalence of males and females with normal HB level anemia are 53.6% and 46.4%, respectively.

G. The joint prevalence between male students and moderate & mild anaemia is 0.3% & 7.7% respectively while it is 42.8% for students with normal HB level.

H. The joint prevalence between female students and moderate & mild anaemia is 0.6% & 11.5% respectively while it is 37.1% for students with normal HB level.

Let us now test the null hypothesis:

H_0 **: There is no association between anemia types and gender at level of significance** $\alpha = 0.05$ **.**

Table 6: Chi-square Value, Phi Measure of Association and P-value: Anemia and Gender

Statistic	**Chi-Square**	**Phi**	**P-Value**
Value	3.90	0.122	0.042

Table 6 shows that the asymptotic-significance=p-value=probability value=0.048 is less than the level of significance $\alpha = 0.05$, therefore we reject H_0 at $\alpha = 0.05$ and conclude that the anemia forms and gender are dependent. That is, the results are statistically significant. Furthermore we can say that the smallest level of significance (or the observed α) to reject H_0 is 0.048.

Having obtained a significant chi-square, we will try to locate the source of significance. We find that large contributions to chi-square come from the under normal anemia form, where the relative frequency is 15.7% for males and 2.7% for females.

Note that χ^2 =1.54+0.39+1.58+0.39=3.90.

Furthermore the Cramer's V measure of association is 0.112 with p-value 0.048. Therefore, the result is statistically significant.

Conclusion: From the above discussion we see that the result is statistically significant. There is an association between the anemia types (below normal and normal) and gender. Also, the large contributions to chi-square come from the non-normal anemia type.

6.2.1.c Income

In table 4 we measure the prevalence of anemia among income classes and investigate whether the two characteristics (anemia and income) co vary. There results are:

A. The sample proportion of above average, average and below average income is 65.5% 29.4% and 5.1% respectively.
B. The prevalence of moderate and mild anaemia within income below average group was found to be 0.0% & 31.2% respectively while the ratio of students with normal HB level was 68.8%.
C. The prevalence of moderate and mild anaemia within average income group was found to be 0.0% & 23.9% respectively while the ratio of students with normal HB level was 76.1%.

D. The prevalence of moderate and mild anaemia within above average income group was found to be 1.5 % & 16.1% respectively while the ratio of students with normal HB level was 82.4%.

E. The prevalence of moderate anaemia within income below average, average income and above average income groups are 0%, 0% and 100% respectively.

F. The prevalence of mild anaemia within income below average, average income and above average income groups are 8.3%, 36.7% and 55.0%, respectively.

G. The prevalence of students with normal HB level within income below average, average income and above average income groups are 4.4%, 28.0% and 67.6% respectively.

H. The joint prevalence between income below average group and moderate & mild anaemia is 0.0% & 7.0% respectively while it is 22.4% for students with normal HB level.

I. The joint prevalence between income above average group and moderate & mild anaemia is 1.0% & 10.5% respectively while it is 54.0% for students with normal HB level.

Let us now test the null hypothesis:

H_0 **: There is no association between anemia forms and income at level of significance** $\alpha = 0.05$ **.**

Table 7: Chi-square Value, Phi Measure of Association and P-value: Anemia and Income

Statistic	**Chi-Square**	**Phi**	**P-Value**
Value	5.47	0.132	0.242

The asymptotic-significance=p-value=probability value=0.242 is greater than the level of significance $\alpha = 0.05$. Therefore we do not reject H_0 at $\alpha = 0.05$ and conclude that the anemia forms and income are independent, that is, the results are statistically insignificant.

Conclusion: From the above discussion we conclude that there is no association between anemia form and income.

6.2.2 Binary Logistic Regression and Odds Ratio

In this subsection we are interested in determining the factors that explain the dependent variable anemia types; below normal (coded 1) and normal (coded 0). We assume that the related factors are age group, gender and income.

Our fitted model is:

$$\log it\,\hat{\pi} = -1.77 + 0.185\ Ageg(1) - 0.526\ Ageg(2) - 0.647\ Gender(1) + 1.157\ Incomeg(1) + 0.387\ Incomeg(2)$$

Where $\pi = P(Y=1) = P(under-normal\ anemia)$ given the factors age groups, gender and income. The interpretation of the coefficients estimates can be handled using the concept- odds ratios, which are shown in table 8 below:

Table 8: Odds Ratio - Anaemia

Odds Ratios	Value
Odds[Age(1)]/ Odds[Age(3)]	1.203
Odds[Age(2)]/ Odds[Age(3)]	0.592
Odds[Gender(1)]/ Odds[Gender(2)]	0.523
Odds[Income(1)]/ Odds[Income(3)]	3.181
Odds[Income(2)]/ Odds[Income(3)]	1.472

Income1 = below average

Table 8 shows the following:

A. Irrespective of school-children gender and income:

1. The odds of under-normal anemia for school-children whose age group 11-12 are 1.203 times the odds of under-normal anemia for school-children whose age group 15-16.
2. The odds of under-normal anemia for school-children whose age group 13-14 are 40.8% lower than the odds of under-normal anemia for school-children whose age group 15-16.

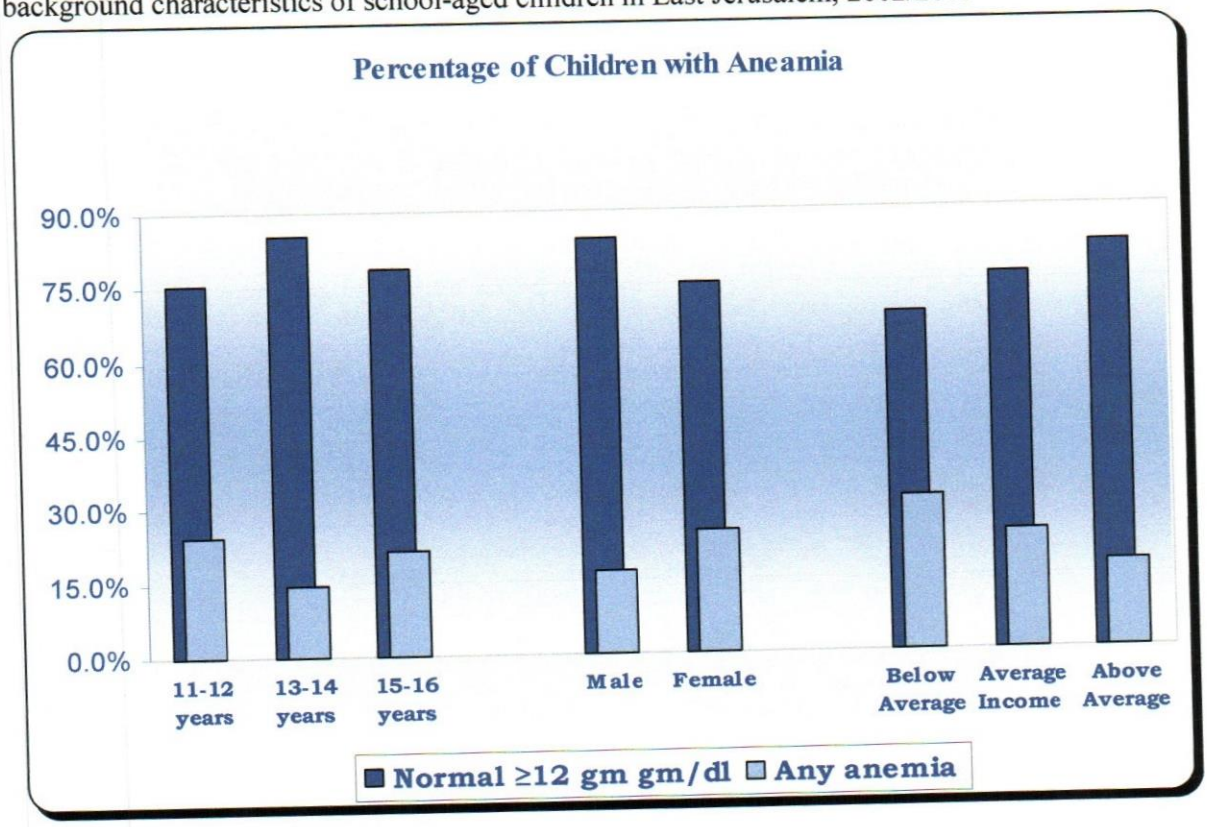
B. Irrespective of school-children age and income:

1. The odds of under-normal anemia for male's school-children are 47.7% lower than the odds of under-normal anemia for female's school-children.

C. Irrespective of school-children age and gender:

1. The odds of under-normal anemia for school-children whose income below average are 3.181 times the odds of under-normal anemia for school-children whose income above average 15-16.
2. The odds of under-normal anemia for school-children whose income is average are 1.472 times the odds of under-normal anemia for school-children whose income above average 15-16.

Graph5: Prevalence of anaemia in children
Percentage of children aged 11-12, 13-14 and 15-16 years classified as having anaemia, by background characteristics of school-aged children in East Jerusalem, 2002/2003



The Egyptian Demographic and Health Survey (EDHS) carried out in the year 2000 -using the same cutoff values in this study- has reported higher results. Around 3 in 10 children aged 11-19 years were anaemic. Most were considered to be mildly anaemic, 2% were classified as having moderate anaemia and a negligible proportion was severely anaemic. The prevalence of anaemia among children aged 11-19 years increased with age. In part, this reflects the onset of menarche among girls and subsequent regular blood loss.

The national nutrition survey of Oman showed that iron deficiency anaemia is still one of the main nutritional problems among young children and adolescent girls. The prevalence of anaemia was found to be 38% among school children (Amine EK., 1980). Another study done later by Abdul Rahman Musaiger in Oman showed that the prevalence in school children ranged from 13% to 51% among males and 32% to 78% among females.

The current study recorded lower prevalence of anaemia among school-aged children in East Jerusalem in comparison with neighboring countries such as Oman and Egypt. Oman had the highest prevalence at 38%, followed by Egypt at 30% and East Jerusalem at 20.2%.

6.3 **Prevalence of Malnutrition**

6.3.1 Body Mass Index (BMI)

In this section of we will consider the prevalence of BMI among school-children in Jerusalem according to some socio-economic variables. Anemia type, age group, gender, and income will be considered. Table 9 & graph 6 will thoroughly reflect the school-aged children status.

Table 9: Nutritional status of children by background characteristics

Percentage of children aged 11-12, 13-14 and 15-16 years classified by mean body mass index (BMI), by background characteristics and anaemia type of school-aged children in East Jerusalem, 2002/2003

	Body Mass index BMI (Kg/H^2)						
		Thin			Overweight/Obese		
Background Characteristics	Normal 18.5-24.9	Severe < 16	Moderate 16-16.9	Marginal 17-18.4	Overweight 25-29.9	Obese ≥30	# of children
Age groups							
11-12 years	46.1{29.2} (16.8)[59]	10.9{87.5} (4.0)[14]	9.4{52.2}((3.4)[12]	22.7{52.7} (8.3)[29]	7.8{25.0} (2.8)[10]	3.1 {26.7} (1.1)[4]	100.0 (36.5)[128]
13-14 years	56.9{32.7} (18.8)[66]	1.7{12.5} (0.6)[2]	6.9{34.8} (2.3)[8]	16.4{34.5} (5.4)[19]	12.9{37.5} (4.3)[15]	5.2{40.0} (1.7)[6]	100.0 (33.0)[116]
15-16 years	72.0{38.1} (21.9)[77]	0.0{0.0} (0.0)[0]	2.8{ 13.0} (0.9)[3]	6.5{12.7} (2.0)[7]	14.0{37.5} (4.3)[15]	4.7{33.3} (1.4)[5]	100.0 (30.5)[107]
Total	**{100.0} (57.5)[202]**	**{100.0} (4.6)[16]**	**{100.0} (6.6)[23]**	**{100.0} (15.7)[55]**	**{100.0} (11.4)[40]**	**{100.0} (4.3)[15]**	**(100.0) [351]**
Gender							
Male	56.6{48.5} (27.9)[98]	3.5{37.5} (1.7)[6]	7.5{56.5} (3.7)[13]	19.1{60.0} (9.4)[33]	9.8{42.5} (4.8)[17]	3.5 {40.0} (1.7)[6]	100.0 (49.3)[173]
Female	58.4{51.5} (29.6)[104]	5.6{62.5} (2.8)[10]	5.6{43.5} (2.8)[10]	12.4{40.0} (6.3)[22]	12.9{57.5} (6.6)[23]	5.1{60.0} (2.6)[9]	100.0 (50.7)[178]
Total	**{100.0} (57.5)[202]**	**{100.0} (4.6)[16]**	**{100.0} (6.6)[23]**	**{100.0} (15.7)[55]**	**{100.0} (11.4)[40]**	**{100.0} (4.3)[15]**	**(100.0) [351]**
Income							
Above average	58.5{67.8} (39.0)[137]	4.7{68.8} (3.1)[11]	6.8{ 69.6} (4.6)[16]	15.4{65.5} (10.3)[36]	10.3{60.0} (6.8)[24]	4.3{66.7} (2.8)[10]	100.0 (66.7)[234]
Average	54.5{26.7} (15.4)[54]	5.1{31.3} (1.4)[5]	5.1{21.7} (1.4)[5]	17.2{30.9} (4.8)[17]	13.1{32.5} (3.7)[13]	5.1{33.3} (1.4)[5]	100.0 (28.2)[99]
Below Average	61.1{5.4} (3.1)[11]	0.0{0.0} (0.0)[0]	11.1{8.7} (0.6)[2]	11.1{3.6} (0.6)[2]	16.7{7.5} (0.9)[3]	0.0{0.0} (0.0)[0]	100.0 (5.1)[18]
Total	**{100.0} (57.5)[202]**	**{100.0} (4.6)[16]**	**{100.0} (6.6)[23]**	**{100.0} (15.7)[55]**	**{100.0} (11.4)[40]**	**{100.0} (4.3)[15]**	**(100.0) [351]**
Anaemia Type							
Moderate	33.3{0.6} (0.3)[1]	0.0{0.0} (0.0)[0]	33.3{4.5} (0.3)[1]	0.0{0.0} (0.0)[0]	0.0{0.0} (0.0)[0]	33.3{7.7} (0.3)[1]	100.0 (1.0)[3]
Mild	71.7{24.9} (13.7)[43]	6.7{26.7} (1.3)[4]	1.7{4.5} (0.3)[1]	13.3{16.0} (2.6)[8]	5.0{7.5} (1.0)[3]	1.7{7.7} (0.3)[1]	100.0 (19.2)[60]
Normal	51.6{74.6} (41.2)[129]	4.4{73.3} (3.5)[11]	8.0{ 90.9} (6.4)[20]	16.8{84.0} (13.4)[42]	14.8{92.5} (11.8)[37]	4.4{84.6} (3.5)[11]	100.0 (79.9)[250]
Total	**{100.0} (55.3)[173]**	**{100.0} (4.8)[15]**	**{100.0} (7.0)[22]**	**{100.0} (16.0)[50]**	**{100.0} (12.8)[40]**	**{100.0} (4.2)[13]**	**(100.0) [313]**

- *The first number indicates the prevalence of BMI within Age Groups or gender or income or anaemia*
- *The second number indicates the prevalence of Age Groups or gender or income within BMI { }*
- *The third number indicates joint prevalence ( )*
- *The fourth number indicates Counts [ ]*

6.3.1.a ***Age Group***

In this subsection we consider the BMI across age groups and study whether the two characteristics (BMI and age) are related. According to table 9 we can conclude the following:

A. The overall prevalence of severe, moderate, marginal, overweight and obesity levels are 4.6%, 6.6%, 15.7%, 11.4% and 4.3% respectively. While the overall prevalence of students with normal BMI is 57.7%.

B. The sample proportions within age groups 11-12, 13-14, and 15-16, are 36.5%, 33.0%, and 30.5% respectively.

C. The Prevalence of severe, moderate, marginal, overweight and obesity levels within the age group 11-12 are 10.9%, 9.4%, 22.7%, 7.8% and 3.1%, respectively. While the overall prevalence of students with normal BMI is 46.1%.

D. The Prevalence of severe, moderate, marginal, overweight and obesity levels within the age group 13-14 are 1.7%, 6.9%, 16.4%, 12.9% and 5.2%, respectively. While the overall prevalence of students with normal BMI is 56.9%.

E. The Prevalence of severe, moderate, marginal, overweight and obesity levels within the age group 15-16 are 0.0%, 2.8%, 6.5%, 14.0% and 4.7%, respectively. While the overall prevalence of students with normal BMI is 72.0%.

Let us now test the null hypothesis:

H_0 **: There is no association between BMI and age groups at level of significance** $\alpha = 0.05$ **.**

Table 10: Chi-square Value, Phi Measure of Association and P-value: BMI and Age

Statistic	**Chi-Square**	**Phi**	**P-Value**
Value	41.706	0.345	0.000

Table 10 shows that the asymptotic-significance=p-value=probability value=0.000 is less than the level of significance $\alpha = 0.05$. Therefore, we reject H_0 at $\alpha = 0.05$ and conclude that the BMI

categories and age groups are dependent. In other words, the results are statistically significant. Furthermore we can say that, the smallest level of significance (or the observed α) to reject H_0 is 0.000.

The Phi measure of strong association between the anemia forms and age group was calculated and it is $\phi = 0.345$ with p-value=0.000. This also shows that the association between BMI and age groups is significant.

Conclusion: From the above discussion we conclude that there is a strong association between the BMI and the age groups.

6.3.1.b ***Gender***

In this subsection we consider the prevalence of BMI within gender and look at whether the two characteristics - BMI and gender – are associated with each other. According to table 9 we conclude that:

A. The sample proportion of males and females are 49.3%, and 50.7%, respectively.
B. The prevalence of severe, moderate, marginal, overweight and obesity levels within male students are 3.5%, 7.5%, 19.1%, 9.8% and 3.5%, respectively. While the overall prevalence of male students with normal BMI is 56.6%.
C. The prevalence of severe, moderate, marginal, overweight and obesity levels within female students are 5.6%, 5.6%, 12.4%, 12.9% and 5.1%, respectively. While the overall prevalence of female students with normal BMI is 58.4%.

Let us now test the null hypothesis:

H_0**: There is no association between BMI and gender at level of significance** $\alpha = 0.05$**.**

Table 11: Chi-square Value, Phi Measure of Association and P-value: BMI and Gender

Statistic	Chi-Square	Phi	P-Value
Value	5.199	0.122	0.392

Table 11 explains that the asymptotic-significance=p-value=probability value=0.392 is greater than the level of significance $\alpha = 0.05$. Therefore we do not reject H_0 at $\alpha = 0.05$, and conclude that the BMI categories and gender are dependent. The results are not statistically significant. We can also say that the smallest level of significance (or the observed α) to reject H_0 is 0.392.

Conclusion: From the above discussion we conclude that there is no association between BMI and gender.

6.3.1.c. Income

In this subsection we consider the prevalence of BMI within income groups, and study whether the two characteristics, i.e. BMI and income, are related. According to table 9 we can conclude that:

A. The sample proportion of below average, average and above average income is 5.1%, 28.2%, and 66.7%, respectively.
B. The Prevalence of severe, moderate, marginal, overweight and obesity levels within income below average group are 0.0%, 11.1%, 11.1%, 16.7% and 0.0%, respectively. The overall prevalence of female students with normal BMI is 61.1%.
C. The Prevalence of severe, moderate, marginal, overweight and obesity levels within average income group are 5.1%, 5.1%, 17.2%, 13.1% and 5.1% respectively. The overall prevalence of female students with normal BMI is 54.5%.

D. The Prevalence of severe, moderate, marginal, overweight and obesity levels within above average income group are 4.7%, 6.8%, 15.4%, 10.3% and 4.3% respectively. The overall prevalence of female students with normal BMI is 58.5%.

Let us now test the null hypothesis:

H_0 **: There is no association between BMI forms and income groups at level of significance** $\alpha = 0.05$ **.**

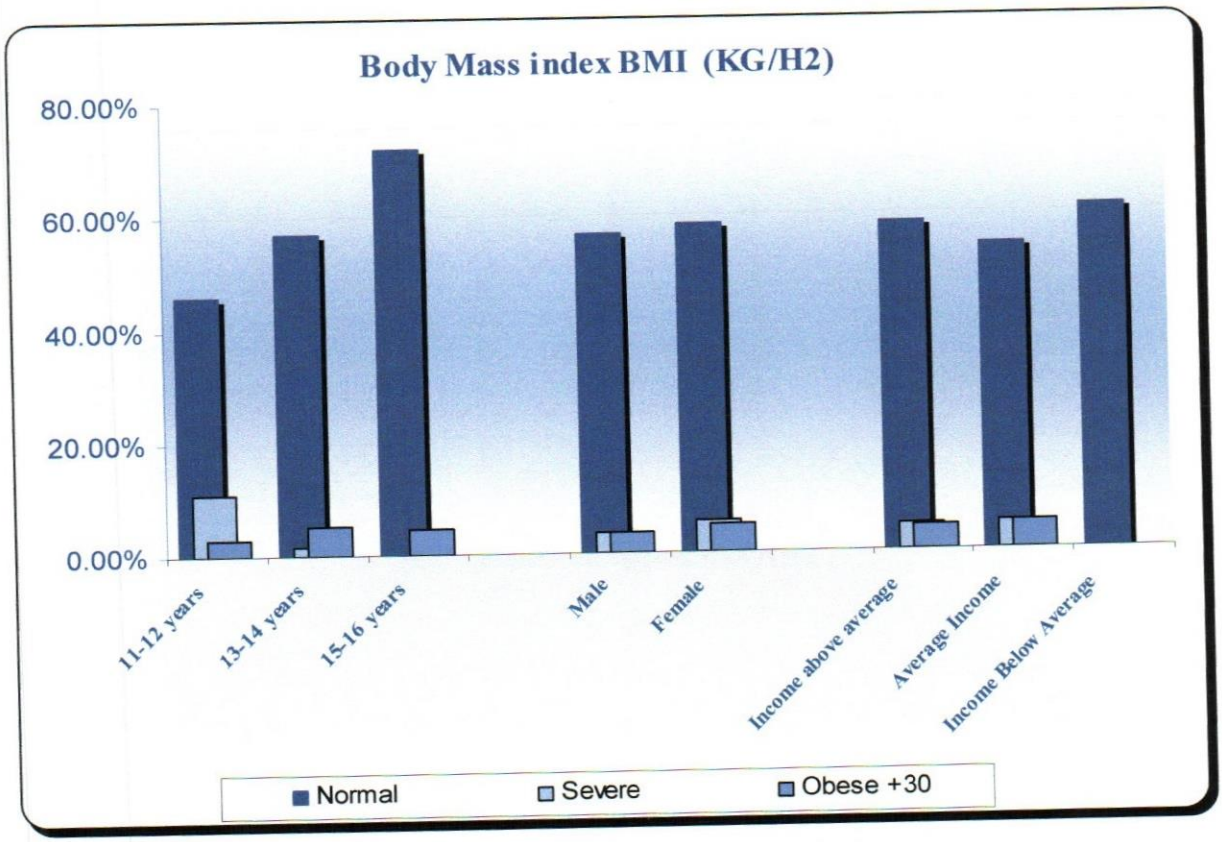
Table 12: Chi-square Value, Phi Measure of Association and P-value: BMI and Income

Statistic	**Chi-Square**	**Phi**	**P-Value**
Value	4.329	0.111	0.931

Table 12 shows that the asymptotic-significance=p-value=probability value=0.931 is greater than the level of significance $\alpha = 0.05$. Therefore we do not reject H_0 at $\alpha = 0.05$, and conclude that the BMI and income groups are independent. Statistically, the results are not significant. Further, we can say that the smallest level of significance (or the observed α) to reject H_0 is 0.931.

Conclusion: From the above discussion, we conclude that there is no association between the BMI categories and income.

Graph 6: Nutritional status of children by background characteristics
Percentage of children aged 11-12, 13-14 and 15-16 years classified by mean body mass index (BMI), by background characteristics of school-aged children in East Jerusalem, 2002/2003



6.3.1.d Anemia

In this subsection we look at the prevalence of BMI within the different anaemia types investigate whether the two characteristics - BMI and anemia – co vary. The results of the analysis are summarized in table 9 below:

A. The prevalence of severe, moderate, marginal, overweight and obesity BMI levels within students with moderate anaemia are 0.0%, 33.3%, 0.0%, 0%, and 33.3% respectively. The overall prevalence of students with normal BMI is 33.3%.

B. The prevalence of severe, moderate, marginal, overweight and obesity BMI levels within students with mild anaemia are 6.7%, 1.7%, 13.3%, 5.0%, and 1.7% respectively. The overall prevalence of students with normal BMI is 71.7%.

C. The prevalence of severe, moderate, marginal, overweight and obesity BMI levels within students with normal HB level are 4.4%, 8.0%, 16.8%, 14.8%, and 4.4% respectively. The overall prevalence of students with normal BMI is 51.6%.

Let us now test the null hypothesis:

H_0 **: There is no association between anemia forms and BMI at level of significance** $\alpha = 0.05$ **.**

Table 13: Chi-square Value, Phi Measure of Association and P-value: BMI and Anemia

Statistic	**Chi-Square**	**Phi**	**P-Value**
Value	22.148	0.266	0.014

The asymptotic-significance=p-value=probability value=0.014 is less than the level of significance $\alpha = 0.05$. Therefore we reject H_0 at $\alpha = 0.05$ and conclude that the anemia types and BMI are dependent, so the results are statistically significant. Furthermore, the smallest level of significance in order to reject the hypothesis of no association between anemia types and BMI is 0.014.

Conclusion: From the above discussion we conclude that there is an association between anemia types and BMI, with significant Phi measure of association equal to 0.266, and p-value=0.014. Furthermore, the prevalence of under normal anemia (anemia less than 12) and underweight is 4.5%, while the prevalence of under normal anemia (anemia less than 12) and overweight/obesity (BMI greater than 25) is 15.7. %.

6.3.2 Energy Intake and Physical Activities

The data in table 14 & graph 7 shows that the median energy for males (1947.2 Kcal) was higher than females (1460.9 Kcal). While females aged 15-16 years had the lowest energy intake

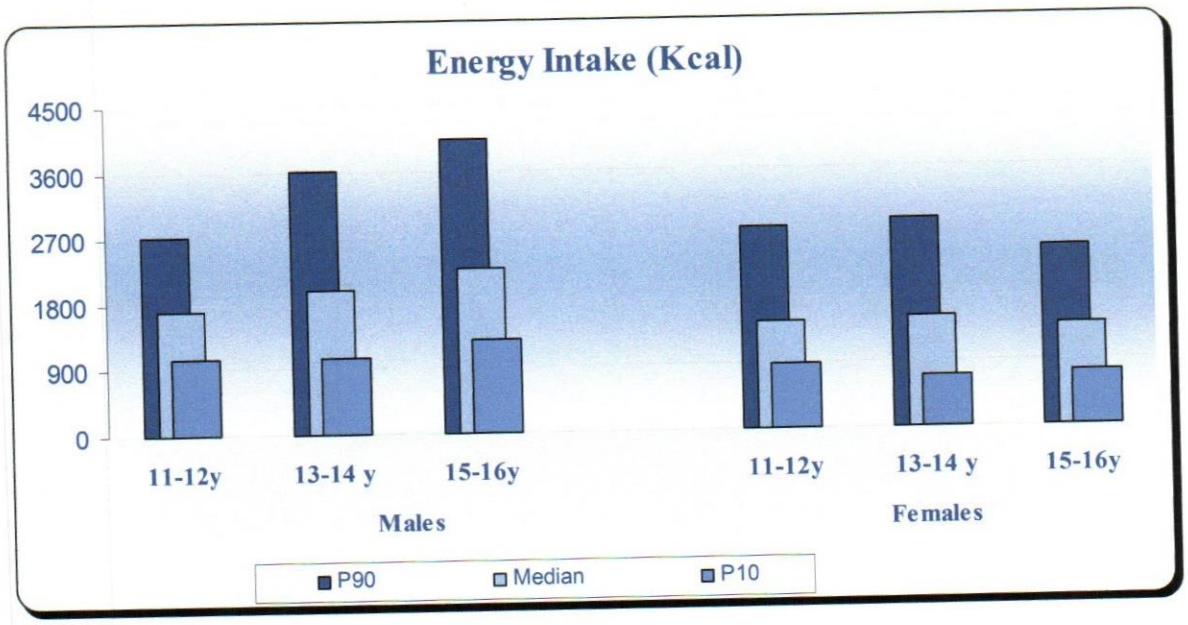
(1404.1 Kcal), males from the same age group had the highest intake (2260.85 Kcal) of the total student body that participated in the study. The total median weight was similar for males and females at 51.6 kg., while the median height for males (159.7 cm) was higher than females (157.1 cm).

Although male school children consume more energy than females, the obesity/overweight ratio was 13.3% among males and 18.0% among females. This may be due to the fact that males are more physically active while females tend to be more sedentary. Based on earlier studies underreporting was measured to be 14% (FPNHNS 2000).

Table 14: Height, weight, and energy of n= 351 by age and gender of school-aged children in East Jerusalem, 2002/2003

Age Group Years	Subjects Number N	Height Cm Median (P10:P90)	Weight Kg Median (P10:P90)	Energy intake Kcal Median (P10:P90)
Males				
11-12y	64	147.6 (136.2; 157.45)	40.9 (32.3; 56.9)	1705.9 (1041.6; 2733.0)
13-14 y	59	162.7 (146.2; 176.7)	53.1 (40.7; 75.3)	1992.8 (1041.7; 3617.5)
15-16y	50	168.3 (158.9; 178.2)	62.6 (50.9; 81.7)	2260.9 (1286.1; 4035.2)
Total	**173**			
Females				
11-12y	64	149.7 (140.0; 161.3)	42.9 (32.6; 70.9)	1470.0 (883.5; 2768.7)
13-14 y	57	157.8 (151.9; 165.2)	51.9 (41.7; 72.0)	1516.1 (688.7; 2869.9)
15-16y	57	160.6 (153.3; 170.8)	56.0 (46.5; 73.2)	1404.1 (753.3; 2476.9)
Total	**178**			
Both Genders				
11-12y	128	148.9 (138.9; 159.7)	41.9 (33.0; 63.5)	1590.05(933.3; 2722.0)
13-14 y	116	159.3 (148.7; 169.8)	52.2 (40.9; 72.5)	1847.00 (873.8; 3070.9)
15-16y	107	165.0 (155.1; 176.3)	59.9 (48.7; 76.1)	1689.40 (876.9; 3740.2)
Total	**351**			

Graph 7: Energy intake by age and gender of school-aged children in East Jerusalem, 2002/2003



Physical activities are activities which lead to fast heart beating and making you breath hard. These activities can be done during sports, school activities, when playing with fellow friends or during going to school. Example on such activities: basketball, soccer, running, swimming laps, fast bicycling, fast dancing or similar aerobics activities?

In this section we consider the relationship between energy intake the physical activities groups (1= one day, 2=two days,…, 7=7 days).

We want to test the null hypothesis:

$$H_0 : \mu_1 = ... = \mu_7$$

Against the alternative hypothesis:

H_1 : not all μ_i are equal, $i = 1,...,7$ at level of significance $\alpha = 0.05$.

We perform this hypothesis using ANOVA (analysis of variance) method. The results are given in the following table.

Table 15: ANOVA for Energy Intake According to Physical Activities

Source of Variation	Sum of Squares	D.F	Mean Squares	F-value	P-value
Between Groups	10408866	6	1734810.920	2.161	0.047
Within Groups	2.48E+08	309	802617.266		
Total	**2.58E+08**	**315**			

From Table 15, since the P-value=0.047 is less than $\alpha = 0.05$, we conclude that the result is statistically significant. This means that there is a relationship between energy intake and physical activity.

Now the aim is to discover the difference between the physical activities groups via multiple comparison approach. We adopt here the least significant differences (LSD) method. The LSD pair wise comparisons: $\mu_i - \mu_j; i \neq j = 1,...,7$ indicate that, at level of significance $\alpha = 0.05$:

1. The difference between μ_1 and μ_6 is statistically significant (P-value=0.004).
2. The difference between μ_1 and μ_7 is statistically significant (P-value=0.034).
3. The difference between μ_2 and μ_6 is statistically significant (P-value=0.040).
4. The difference between μ_4 and μ_6 is statistically significant (P-value=0.005).
5. The difference between μ_4 and μ_7 is statistically significant (P-value=0.043).

The other pair wise comparisons are not statistically significant.

The following table shows the mean energy intake according to physical activities.

Table 16: Mean energy intake according to physical activities.

Physical Activities	**Size**	**Mean**	**95% Confidence Interval for $\mu_i; i = 1,...,7$**
One Day	60	1657.068	(1453.76,1860.37)
Two Days	67	1874.372	(1685.08,2063.68)
Three Days	61	1898.628	(1630.37,2166.89)
Four Days	29	1596.707	(1294.56,1898.86)
Five Days	30	1841.430	(1475.29,2207.570)
Six Days	17	2375.659	(1913.50,2837.82)
Seven Days	52	2017.631	(1749.20,2286.06)
Total	**316**	**1859.727**	**(1759.48,1959.98)**

The number of students who are physically not active = 35

From table 16, we conclude that: with 95% confidence coefficient:

1. The population mean of energy intake for one-day physical activity lies somewhere in the interval (1453.76,1860.37).
2. The population mean of energy intake for two days physical activity lies somewhere in the interval (1685.08,2063.68).
3. The population mean of energy intake for three days physical activity lies somewhere in the interval (1630.37,2166.89).
4. The population mean of energy intake for four days physical activity lies somewhere in the interval (1294.56,1898.86).
5. The population mean of energy intake for five days physical activity lies somewhere in the interval (1475.29,2207.570).
6. The population mean of energy intake for six days physical activity lies somewhere in the interval (1913.50,2837.82).

7. The population mean of energy intake for seven days physical activity lies somewhere in the interval (1749.20,2286.06).
8. The population mean of energy intake for seven days physical activity lies somewhere in the interval (1759.48,1959.98).

6.3.3 Binary Logistic Regression and Odds Ratios

In this subsection we are interested in determining the factors that explain the dependent variable BMI types – under normal (coded 1) and otherwise (coded 0). Assume that the interested factors are: age groups (AG), gender (GE), income (INC), father education (FE) and mother education (ME).

Our fitted model is:

$$\begin{aligned}\log it\hat{\pi} = &-2.031 + 2.164AG(1)1.300AG(2) + 0.327GE(1) + 0.211INC(1) - 0.012INC(2)\\ &-1.690FE(1) + 0.344FE(2) - 0.045FE(3) - 0.851FE(4)\\ &+2.89ME(1) - 0.67ME(2) - 1.139ME(3) - 0.072ME(3)\end{aligned}$$

where $\pi = P(Y=1) = P(under-weight)$ given the factors age groups (AG), gender (GE), income (INC), father education (FE) and mother education (ME).

The interpretation of the coefficients estimates can be handle using the concept- odds ratios. Table 17 gives the odds ratios.

Table 17: Odds Ratios-BMI

Odds Ratios	**Value**
Odds[AG(1)]/ Odds[AG(3)]	8.704
Odds[AG(2)]/ Odds[AG(3)]	3.668
Odds[GE(1)]/ Odds[GE(2)]	1.387
Odds[INC(1)]/ Odds[INC(3)]	1.235
Odds[INC(2)]/ Odds[INC(3)]	0.988
Odds[FE(1)]/ Odds[FE(5)]	0.185
Odds[FE(2)]/ Odds[FE(5)]	1.410
Odds[FE(3)]/ Odds[FE(5)]	0.956
Odds[FE(4)]/ Odds[FE(5)]	0.427
Odds[ME(1)]/ Odds[ME(5)]	18.002
Odds[ME(2)]/ Odds[ME(5)]	0.511
Odds[ME(3)]/ Odds[ME(5)]	0.320
Odds[ME(4)]/ Odds[ME(5)]	0.930

Table 17 shows the following:

A. Irrespective of gender (GE), income (INC), father education (FE) and mother education (ME).

1. The odds of under weight school-children within age group 11-12 are 8.704 times the odds ratio of under weight for school-children within age group 15-16.
2. The odds of under weight school-children within age group 13-14 are 3.668 times the odds ratio of under weight school-children within age group 15-16.

B. Irrespective of Age (AG), income (INC), father education (FE) and mother education (ME).

1. The odds of under weight for male school-children are 1.387 times the odds of under weight for female school-children.

C. Irrespective of Age (AG), gender (GE), father education (FE) and mother education (ME).

1. The odds of under weight for school-children within income below average group are 1.235 times the odds of under weight for school-children whose income above average.
2. The odds of under weight for school-children whose income is average are 0.2% lower than the odds of under weight for school-children whose income above average.

D. Irrespective of Age (AG), gender (GE), income (INC), and mother education (ME).

1. The odds of under weight for school-children whose father education is illiterate are 81.5% lower than the odds of under weight for school-children whose father education is BSC and above.
2. The odds of under weight for school-children whose father education is primary are 1.410 times the odds of under weight for school-children whose father education is BSC and above.
3. The odds of under weight for school-children whose father education is secondary are 4.6% lower than the odds of under weight for school-children whose father education is BSC and above.
4. The odds of under weight for school-children whose father education is diploma are 57.3% lower than the odds of under weight for school-children whose father education is BSC and above.

E. Irrespective of Age (AG), gender (GE), income (INC), and father education (ME).

1. The odds of under weight for school-children whose mother education is illiterate are 18.002 times the odds of under weight for school-children whose mother education is BSC and above.
2. The odds of under weight for school-children whose mother education is primary are 48.9% lower than the odds of under weight for school-children whose mother education is BSC and above.
3. The odds of under weight for school-children whose mother education is secondary are 68% lower than the odds of under weight for school-children whose mother education is BSC and above.
4. The odds of under weight for school-children whose mother education is diploma are 7% lower than the odds of under weight for school-children whose mother education is BSC and above.

6.4 Macronutrient Intake

A diet can roughly be characterized by the amounts of the macronutrients protein fat, and carbohydrates and their specific composition.

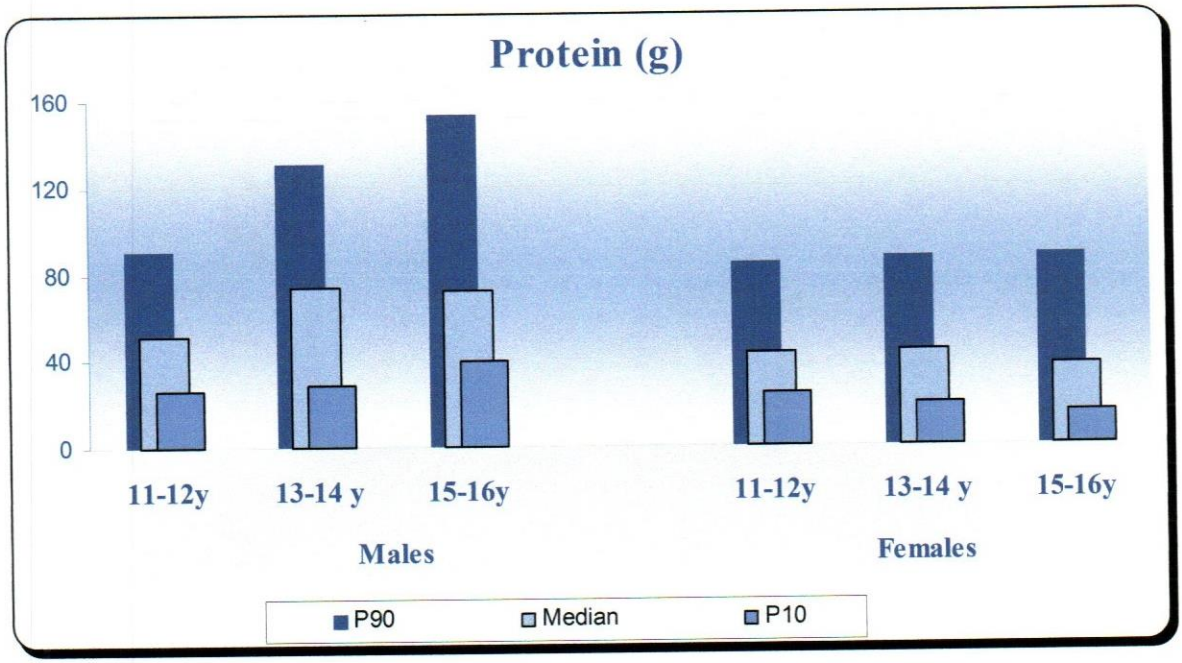
The distribution of the study sample in the different age/gender groups is shown in table 18 together with median energy intakes. The median intake of protein constituted 11.9% of the total energy intake in the studied sample while the median intake by age was (11-12y; 11.5%), (13-14y; 12.3%) and (15-16y ;11.99%).

As shown, the median range of protein intake was 74.0 to 36.7 g/d, males in all age groups consume higher amounts of proteins than females which can be explained by the higher consumption of meat and food that provides protein.

Table 18: Sample Characteristics and data on the dietary intake of protein in n= 351 of school-aged children by age and gender in East Jerusalem, 2002/2003

Age Group	Sample Characteristic		Protein	
	Subjects	Energy intake		
Years	Number N	Kcal Median	g/d Median (P10:P90)	% energy Median
Males				
11-12 y	64	1705.9	51.0 (25.6; 90.3)	11.8
13-14 y	59	1992.8	74.0 (28.3; 130.4)	13.3
15-16y	50	2261.0	72.2 (39.2; 153.4)	13.3
Total	**173**	1947.2		**13.0**
Females				
11-12 y	64	1470.0	42.6 (24.6; 84.7)	11.1
13-14y	57	1516.1	43.9 (19.6; 87.2)	11.2
15-16 y	57	1404.1	36.7 (15.4; 87.7)	10.9
Total	**178**	**1460.9**		**11.87**

Graph 8: Protein intake school-aged children by age and gender in East Jerusalem, 2002/2003



The intake of fat was about 34% of the energy intake in the total sample (33.1 to 34.6% in different age/gender groups). The percentage of energy intake of Saturated Fatty Acids 9.8% (8.3 to 10.5), of Mono Unsaturated Fatty Acids 11.6% (10.9to 12.4), and of Poly Unsaturated Fatty Acids 9.3% (8.2 to 10.0), whereas the cholesterol intake amounted to 126.4 mg/d (200.3 to 75.4 Mg/d) in the total sample (different age/gender groups respectively) (Table 18). When compared with other studies implemented by in Germany (Kersiting M., et al 1998 and references there in), the % median of PUFA was found to be nearly double which is explained by the high usage of vegetable oil in food.

As shown in the table 19 the cholesterol level among males is nearly the double from within females. This may be explained to the fact that boys tend to consume more fried junk food.

Table19: Dietary intake of total fat, fatty acids and cholesterol in n= 351 of school-aged children in East Jerusalem, 2002/2003

Age Group	Total fat		Fatty acids			Cholesterol
			SFA	MUFA	PUFA	
Years	g/d Median (P10:P90)	% energy Median	% energy Median	% energy Median	% energy Median	Mg/d Median
Males						
11-12 y	61.2 (33.9; 104.6)	34.7	9.6	12.0	9.8	131.6
13-14 y	72.3 (34.4; 150.7)	33.4	8.3	11.2	9.3	189.5
15-16 y	86.1 (39.4; 186.3)	34.5	10.5	12.4	8.2	200.3
Total		**34.2**	**9.9**	**11.8**	**9.0**	**165.9**
Females						
11-12 y	55.2 (30.5; 115.1)	34.4	10.1	11.7	9.5	77.7
13-14 y	57.6 (23.2; 115.9)	33.8	9.5	10.9	10.0	93.0
15-16 y	43.4 (25.1; 102.2)	32.5	9.6	11.0	8.5	75.4
Total		**33.7**	**9.7**	**11.1**	**9.5**	**79.3**
Both genders						
11-12 y	59.4 (31.2; 106.2)	34.6	9.8	11.8	9.7	100.2
13-14y	64.3 (24.1; 132.7)	33.5	9.3	11.0	9.6	143.8
15-16 y	69.2 (27.9; 150.9)	33.1	10.0	11.7	8.5	142.7
Total		**33.9**	**9.8**	**11.6**	**9.3**	**126.4**

The mean dietary intakes of school-aged children by gender, age and school ownership are shown in table 21 a, b and c. In general, municipality students had the lowest energy intake, as well as carbohydrates, protein, total fat, saturated fat and cholesterol among all school ownerships, with private school students had the highest macronutrient rates of intake.

Municipality students derived most of their energy from carbohydrates 56.2% and 31.48% from total fat. This study show that the student median intake of protein is relatively close among different school ownerships, with private school students (50.15g), PA schools (51.6g) followed by UNRWA and Municipality students (48.2 g, 37.65g) respectively.

It is unfortunate that is no other regional studies to compare our data with.

Table21a: Daily nutrients intake, by school ownership and gender of school-aged children 11-12 years in East Jerusalem, their Health and nutritional status, 2002/2003

Age Group	School type	Gender	Sample n	ENERGY (Kcal)	CARBOHYDRATE (gm)	PROTEIN (gm)	TOTAL_FAT (gm)	SATURATED FAT (gm)	CHOLESTEROL (mg)	CHO (En%)	Protein (En %)	Total Fat (En %)	SFA (En %)
11 - 12 Y	PA school	Male	2o	1767.3	226.2	51.2	61.5	16.3	94.1	57.0	11.3	33.2	9.3
		Female	20	1379.0	188.6	34.8	55.7	15.4	70.8	57.8	11.5	35.0	10.0
		Total	40	1518.3	206.4	44.8	60.4	15.9	88.5	57.4	11.4	33.8	9.7
	Private school	Male	20	1988.4	271.3	61.3	78.5	21.0	190.1	50.5	13.1	36.6	11.8
		Female	20	2244.6	307.3	57.1	79.9	24.7	125.6	56.8	11.0	33.9	11.5
		Total	40	2116.5	282.9	60.6	78.5	21.5	173.3	54.5	11.5	35.5	11.6
	Municipality Schools	Male	9	1252.9	168.9	39.2	45.8	15.3	89.4	54.9	13.3	29.9	9.3
		Female	10	1212.8	172.3	35.7	44.3	12.8	65.1	56.1	12.2	32.2	10.2
		Total	19	1232.9	170.8	36.8	45.1	13.3	80.5	56.0	12.2	31.9	10.0
	UNRWA Schools	Male	20	1609.1	221.9	52.1	57.1	15.4	142.3	54.7	12.6	34.6	9.1
		Female	17	1635.0	214.0	42.6	56.9	16.4	93.2	55.6	10.9	35.1	8.7
		Total	37	1609.1	219.3	47.4	56.9	15.7	129.0	55.0	11.6	35.0	8.9
	Total	Male	69	1705.9	224.8	51.0	61.2	16.8	131.6	54.9	11.8	34.7	9.6
		Female	67	1470.0	196.8	42.6	55.2	16.8	77.7	56.1	11.1	34.4	10.1
		Total	136	1590.1	220.0	46.4	59.4	16.8	100.2	55.7	11.5	34.5	9.8

Table21b: Daily nutrients intake, by school ownership and gender of school-aged children 13-14 years in East Jerusalem, their Health and nutritional status, 2002/2003

Age Group	school type	Gender	Sample n	ENERGY (Kcal)	CARBOHYDRATE (gm)	PROTEIN (gm)	TOTAL_FAT (gm)	SATURATED FAT (gm)	CHOLESTEROL (mg)	CHO (En%)	Protein (En %)	Total Fat (En %)	SFA (en%)
13 - 14 Y	PA school	Male	19	2345.4	290.7	78.0	93.5	29.7	197.1	53.9	12.9	35.1	10.3
		Female	20	1454.7	198.3	39.9	60.5	16.6	74.3	53.7	11.3	35.9	10.6
		Total	39	1990.4	266.9	55.3	69.9	20.4	153.7	53.8	12.1	35.8	10.5
	Private school	Male	20	1880.1	258.9	78.0	74.6	18.8	353.1	54.6	14.3	33.3	8.9
		Female	20	1717.2	254.5	50.1	59.0	17.9	119.8	60.0	11.8	29.9	9.6
		Total	40	1863.3	258.9	64.1	63.9	18.1	167.1	56.2	12.4	32.1	9.6
	Municipality Schools	Male	0	1720.6	230.8	63.0	63.9	20.1	151.2	53.7	14.7	33.4	10.5
		Female	4	1354.3	192.3	35.3	44.6	15.9	102.0	62.7	11.8	26.5	10.3
		Total	4	1363.4	202.3	41.2	53.3	17.8	106.3	61.5	12.6	28.1	10.2
	UNRWA Schools	Male	20	1785.6	237.2	68.4	61.0	16.2	124.6	54.5	13.4	30.3	7.9
		Female	19	1560.2	240.2	43.9	53.7	15.8	116.7	56.8	10.3	35.3	9.1
		Total	39	1742.3	237.4	45.8	59.1	16.2	118.0	54.9	11.7	31.1	8.2
	Total	Male	59	1992.8	273.7	74.0	72.3	19.5	189.5	54.7	13.3	33.4	8.3
		Female	63	1516.1	214.5	43.9	57.6	16.9	93.0	56.5	11.3	33.8	9.5
		Total	122	1847.0	243.5	53.1	64.3	17.9	143.8	54.8	12.3	33.5	9.3

Summary, Recommendation & Conclusion Chapter (7)

7.1 Introduction

It is evidence based that multifaceted programs in adolescents are more effective (Kurz KM., 1996). This approach was put on the WHO/UNFPA/UNICEF agenda for adolescent health. It is intended to provide accurate knowledge, build skills, provide counseling, improve access to health services, and ensure safe and supportive environments (WHO, 1995).

For Palestinian adolescent nutrition to be specifically addressed, the following strategies which concentrate on promotion, prevention, and treatment components should be followed by health sectors:

1) Nutrition promotion, as part of health promotion

2) Prevention (and management) of main nutritional problems

Nutrition promotion is a major component, and it should be in the background of all nutrition-related activities. Promotion and prevention are more critical than clinical care for adolescents' present and future nutritional health, as for health in general.

7.1.1 Primary focus on nutrition promotion, and the central role of the school

According to the WHO, Schools have a major role in promoting healthy nutrition among School children. The WHO's global school health initiative and the 'health promoting

schools' program (WHO, 1996a) provides an appropriate framework for enhancing nutrition among school children. School-based programs have been found effective (Chendi, H., 1998), it may also encourage children and adolescents to remain in school, school-feeding programs, for instance (Simeon DT., 1998, Jacoby ER., et al 1998). This is particularly important for girls (World Bank, 1993). It is a challenge to reach adolescents who do not go to schools in the West Bank and Gaza.

The health promotion approach, which integrates the determinants of health and aims at empowering people, is particularly appropriate for addressing nutrition in adolescents (Nutbeam D., 1997). Improving access to food and enhancing control of adolescents over their food resources should get appropriate emphasis as a major component of the supportive environment, and as a prerequisite for nutrition security (Delisle H., 1998a). Improving access to appropriate nutrition services for adolescents is also required, in addition to strengthening their skills for adopting healthy eating and lifestyle (Chauliac M., et al, 1996).

For the success of the proposed strategy, it is quite important to understand how Palestinian young people themselves view health-related issues such as nutrition. The various levels of influence, including culture, peers, family, have to be considered (Schucksmith, J., et al 1998). The 'Life events' approach as used to explain adolescents' perception of health may also provide insights for nutrition promotion strategies (Cordonnier, D., 1995).

Through encouraging adolescents healthy eating and physical activities, school help in nutrition promotion and education. This promotion will help in strengthening self-esteem as a means of resisting unpleasant environmental influences on eating and dieting practices among adolescents; it will also to contribute to preventing obesity and disordered eating through these attitudes and behaviors.

Schools may also be a focal point for micronutrient programs and particularly food approaches, as will be discussed below.

7.1.2 Prevention and management of nutritional problems and risks

This second strategy involves prevention and management of nutritional problems and risks. Prevention is particularly relevant in adolescents, and it is in line with nutrition promotion; the only difference is that it focuses on a specific condition, be it malnutrition, specific micronutrient deficiencies, or overweight.

Effective prevention in nutrition lies in large part in behavior reinforcement or change. It is less costly than treatment. Although a commonly held belief is that such programs are ineffective (FAO, 1994). Yet, the corpus of knowledge on effective means of inducing behavioral change through nutritional communication is growing, as well as documented evidence of impact, particularly in young people. Research has an important role in this regard, as well as for evaluation of interventions.

The prevention and management process can be done by implementing the following issues:

7.1.2.1 Nutritional Assessment

Nutritional assessment should be an inherent part of preventive health care services to Palestinian adolescents. This includes anthropometry, and weights and heights could even be regularly measured in schools.

It is important to assess both undernutrition and obesity in adolescents by improved tools. Existing height and BMI data are useful, provided adjustments are made for maturity (WHO, 1995a). Adolescent-specific reference data for Palestinian use will need to be developed and validated against other measures of obesity, and also, against co-morbidity risk factors. Two years after puberty, adult BMI cutoffs may be used for overweight, and it has been suggested that equivalent cut-offs be defined for BMI-for-age at adolescence (Dietz WH., et al 1998).

Nutritional assessment also involves dietary assessment. Dietary assessment is all too often by-passed as unnecessary or too complex in health and nutrition work, at population or individual level (IVACG, 1989; Rockett HR., et al 1997).

7.1.2.2 Management of severe malnutrition in adolescents

Prevention of malnutrition in Palestinian adolescents is done primarily through promotion of healthy

eating, and food security measures for adequate access to food. In adolescents, malnutrition may be more common than normally assumed in emergency situations, and as part of emergency health care, the health sector should address this issue.

Once detected, severe malnutrition is reportedly to be treated much the same as in younger children (WHO, 1999c), although refeeding may be more difficult among adolescents because of anorexia and resistance to tube feeding, and because protein content of the diet is more critical because of more common oedema.

The problem is that owing to inadequate scientific basis for screening, management, and discharge criteria, severe malnourished adolescents are seldom included in therapeutic or supplementary feeding programs offered younger children in emergency settings, and unless the nutritional status of adolescents is appraised, it is uneasy to draw attention on high malnutrition rates, and on the need to provide nutritional support.

7.1.2.3. Prevention (management) of obesity

Primary prevention of obesity is predominantly done through promoting healthy eating and physical activity. It is not much different among adolescents and younger school-age children, except that obesity prevention should be given more emphasis in adolescents.

Essentially the same messages on eating hold, whether for general health, and for the prevention of obesity and other chronic diseases. Where obesity is increasing and leanness is becoming a social norm, prevention of eating disturbances through strengthening self-

esteem and a positive body image is more pertinent at adolescence, and particularly in girls.

Schools appear as an ideal setting to help in the primary prevention of obesity, as it can be assumed that in developing countries, the related problems of obesity and eating disturbances are more likely to be encountered in better-off adolescents, whose majority would still be in school, and who are under a marked influence of western youth lifestyles and values.

Prevention of obesity among adolescents is highly relevant wherever it, or else where it may soon become so.

Rosen and Neumark-Sztainer in their 1998 review suggested that school-based prevention programs should target the following:

1) Reducing body dissatisfaction;

2) Critical thinking about socio-cultural and peer norms;

3) Understanding physical development;

4) Improved knowledge about nutrition and weight control; and

5) Skill development for healthy eating and weight management. Ideally, this should be combined with opportunities for healthy eating right at school.

6) Promoting physical activity and exercise.

7.2 Conclusions and recommendations

Nutritional vulnerability may in certain respects be lower in adolescence than early childhood. It is mostly because adolescence provides a window of opportunity for long term positive impact that nutrition should be a priority in adolescents. It is a challenge, however, considering that while health is not a major concern at that age, promotion of healthy nutrition behaviors is the core element.

Palestinian schools ought to develop close links with health services for prevention and management of specific nutrition disorders, and with community development programs to address food security problems.

There is at present so little data on Palestinian adolescents' nutritional status and micronutrient nutrition, eating patterns and underlying influences, and on impact of nutrition intervention in adolescence, that research needs are immense.

In order to develop appropriate anthropometric reference data, a multi-country study, with longitudinal and cross-sectional components, on adolescents' somatic growth and maturation should be considered high priority. Such data are needed to define not only cut-off points, but also rates of too low or too high values that should trigger action at program or individual level. Meanwhile, the feasibility of routine weight and height measurements in schools, including adolescents and younger children, deserves to be examined. BMI nomograms and tables with percentile cut-offs for under-, as well as over-weight, as well as appropriate guidelines for their use with adolescents (and younger school-age children),

could be useful for schools and health services, while efforts are pursued to develop specific reference data.

It was suggested earlier that adolescents (and schools) were ideal targets for food-based Approaches to improving micronutrient status. The effectiveness of pilot interventions focusing on achievable improvements of micronutrient and macronutrient status through food would urgently need to be evaluated, with considerations of process, cost and sustainability in addition to micronutrient status impact.

A better understanding of Palestinian adolescents' diets and eating behaviors is essential for relevant education programs. Additionally, dietary enquiry tools specifically designed for adolescents are direly needed. The enquiry should encompass household food security, food diversity (as indicator of nutritional quality), eating practices and underlying influences, and physical activity. These tools need to be developed and validated in different settings, in connection with school-based or health centre-based intervention programs rather than as free-standing research, for higher relevance. Participatory approaches are particularly well suited for research work with adolescents.

Research on two contrasting themes – severe malnutrition and obesity in adolescents - is also recommended as a means of strengthening program. Studies on nutritional assessment, rehabilitation, and discharge criteria in severely malnourished adolescents are called for, as well as evaluation research on the impact of school-based pilot projects for nutrition promotion and prevention of obesity.

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Appendix A: HBSC Sampling Framework 2002

The sampling methodology designed for this study has the following characteristics:

1.1 The sampling is performed in two stages, denoted below as Stage I and Stage II, respectively.

1.2 In Stage I, for each school-class (denoted below as class) separately and independently, a decision is made on whether that class is included in the sample.

1.3 Within each class level t separately (6^{th}, 8^{th}, 10^{th},), t=1,2,3, let $g_{j(t)}$ be the number of classes selected in Stage I from each school j(t), j(t)=1,2, 3.. J(t). Furthermore let the total number of classes in school j(t) be $m_{j(t)}$. The sampling in Stage II has the following characteristics:

- if $m_{j(t)}=1$ and/or if ($g_{j(t)}=0$ or $g_{j(t)}>1$), no class will be selected in Stage II from school j(t), otherwise
- an additional class is randomly selected from school j(t) out of the remaining $m_{j(t)}-1$ classes in the school.

1.4 The design of the sample has to ensure that all the classes within each class level t will have the same pre-specified probability π_t to be included in the sample, while conforming to the conditions detailed in 1.1-1.3 above.

1.5 Additionally, at each class level t, the population of N_t classes is further divided into three domains: Public, UNRWA and private, with number of classes denoted by N_{t1}, N_{t2}, N_{t3}, respectively, with $N_{t1}+ N_{t2}+ N_{t3} = N_t$. The actual domain sizes in the 1998 were as follows:

Class level	Public (PA)	Municipality	UNRWA	Private	Grand Total
6^{th}	$N_{11}=$	$N_{12}=$	$N_{13}=$	$N_{14}=$	$N_1=$
8^{th}	$N_{21}=$	$N_{22}=$	$N_{23}=$	$N_{24}=$	$N_2=$
10^{th}	$N_{31}=$	$N_{32}=$	$N_{33}=$	$N_{34}=$	$N_3=$
Grand Total					

A further goal of the sampling scheme is to ensure that the proportion in the sample of the expected values of the number of classes from each domain will equal the corresponding proportions in the population. Thus if we denote the corresponding sample sizes by n_{t1}, n_{t2}, and n_{t3}, $n_{t4,}$ respectively, (with $n_{t1}+ n_{t2}+ n_{t3} = n_t$), and denote the expected values by $E(n_{t1})$, $E(n_{t2})$, and $E(n_{t3})$, respectively, we aim to construct the sample size such that

$E(n_{t1}) /N_{t1} = E(n_{t2}) /N_{t2} = E(n_{t3}) /N_{t3} =$

Several remarks are in order with respect to the sampling scheme proposed here:

1.6 For each class level t, while the overall probabilities to be included in the sample are equal for all the classes (and equal to π_t), this is not the case for the probabilities in Stages I and II.

1.7 In the sampling scheme suggested here the sample sizes n_t are random variables. We can ensure that for each class level t, with N_t classes, $N_t = \Sigma_1^{J(t)} m_{j(t)}$, the expected value of n_t will equal a pre-specified value $E(n_t)$ by specifying that for that class level, $\pi_t = E(n_t) /N_t$.

1.8 The sampling scheme that ensures that for each level class level t, all the classes have the same probability π_t to be included in the sample, also ensures that (as requested in 1.5 above)

$E(n_{t1}) /N_{t1} = E(n_{t2}) /N_{t2} = E(n_{t3}) /N_{t3}$.

This is easily proved, when one noticed that since the selections are independent and with equal probabilities, then for each k=1,2,3, 4

$E(n_{tk}) = N_{t1} * \pi_t$, and thus $E(n_{tk}) /N_{tk} = \pi_t$, for all k.

2. The probabilities

In Stage I, the probability of inclusion in the sample for a specific class, say C, from school j(t) at school level t, is a function of:

- the number of classes in the school $m_{j(t)}$, and
- the pre-specified probability π_t for the school level t.

Let us denote p_{mt} the probability that a specific class from school j(t) with $m=m_{j(t)}$ classes at school level t is selected in the sample at Stage I. Let $g=g_{j(t)}$ be the number of classes selected at Stage I from the school j(t). The probability that a specific class, say C, will be selected in the sample can be represented as follows:

For m=1

Pr(C is selected | m) = Pr(C is selected at Stage I | m) = $p_{mt}=\pi_t$.

For m>1

Pr(C is selected | m) = Pr(C is selected at Stage I | m) +

Pr(C is selected at Stage II | m, g=1 $\cap$ C is not selected at Stage I)* Pr(g=1 $\cap$C is not selected at Stage I| m).

Now,

Pr(C is selected at Stage I | m) = p_{mt},

Pr(C is selected at Stage II | m, g=1 $\cap$ C is not selected at Stage I) = 1/(m-1), and

Pr(g=1 $\cap$ C is not selected at Stage I) =

Pr(at Stage I out of the other m-1 classes in school exactly one is selected and C is not selected)=

$$= (1- p_{mt})*Pr (X=1),$$

where $X \sim$ Binomial (m-1, p_{mt}), and thus

Pr(at Stage I out of the other m-1 classes in school exactly one is selected and C is not selected)=

$$=(1- p_{mt})*(m-1)*p_{mt}^{1}(1- p_{mt})^{m-2}$$

Therefore, for m>1,

Pr(C is selected | m) = Pr(C is selected at Stage I | m) +

Pr(C is selected at Stage II | m, g=1 $\cap$ C is not selected at Stage I)* Pr(g=1 $\cap$C is not selected at Stage I| m)=

$= p_{mt} + 1/(1- p_{mt})* (1- p_{mt})*(m-1)*p_{mt}^{1}(1- p_{mt})^{m-2} = p_{mt} + p_{mt}(1- p_{mt})^{m-1}$

which has to be equated to the pre-specified π_t.

The equation $\pi_t= p_{mt} + p_{mt}(1- p_{mt})^{m-1}$ has to be solved by numerical methods for p_{mt}. It is easy to see that since $(1- p_{mt})^{m-1}\leq 1$, $\pi_t= p_{mt} + p_{mt}(1- p_{mt})^{m-1}= p_{mt} [1+ (1- p_{mt})^{m-1}] \leq 2p_{mt}$.

Therefore, $p_{mt} \geq \pi_t/2$, namely, for each school size m>1, the probability at Stage I is larger than half the overall probability π_t. As we'll see below, p_{mt} does not exceed by much $\pi_t/2$. Furthermore, from the numerical solutions we'll see that p_{mt} increases with m.

3. The performance of the sampling

The actual sampling will be performed according to the following steps (see the table below):

3.1 For each class in each school we create two unique id's formed by the school number, the class level and the id of the parallel class. The difference between the two id's originate from the definition of the "id of the parallel class": in the first, the id are the original numbers (which are not necessarily in increments of 1), while in the second the ids of the parallel classes are in increments of 1.

3.2 To each class at each class level in each school we attached the corresponding p_{mt}, i.e. the probability that that specific class from the with m classes at the particular school level t is selected in the sample at Stage I.

3.3 A set of $N=N_1+ N_2+ N_3$ uniform (0,1) independent random variables are created (i.e. U_s are i.i.d. U(0,1), s=1,..N) and attached to the N classes in the population.

3.4 For all the classes we create indicator random variables Z_s which get the value 1 if $U_s \leq p_{mt}$ and 0, otherwise. All the classes with $Z_s = 1$ are selected to the sample in Stage I.

3.5 An additional deterministic indicator T_s is attached to each class, which assigns the value 1 only if the three conditions ($Z_s = 1$, m>1, g=1) are all satisfied.

3.6 For each class with $T_s = 1$ and with a specific m, we create an integer random variable between 1 and m-1. The corresponding parallel class among the m-1 classes not selected at Stage I is now selected at Stage II.

Annex1

موافقة على استبيان معروف المضمون

مرحبا، اسمي كرستين جلدة طالبة ماجستير في كلية الصحة العامة/جامعة القدس. أجري استبيانا حول التغذية الخاصة بأطفال المدارس وسأقدر جدا اشتراككم في هذا الاستبيان. أحب أن أسأل أطفالكم عن صحتهم. سوف تساعد هذه المعلومات على تقييم الوضع الصحي لأطفال المدارس. سيستغرق الاستبيان بين 20-45 دقيقة لاتمامه كما سيتم فحص مدى قوة تركيز الهموجلوبين في الدم وذلك بواسطة فحص نقطة دم من الإصبع وستعطى النتيجة للطلاب على الفور. أية معلومات تتقدم تبقى سرا ولن تكشف لأشخاص آخرين.

الاشتراك في هذا الاستبيان طوعي ويستطيع ابنك/ابنتك الخيار في عدم إجابة أية سؤال أو جميع الأسئلة. على أية حال نحن نأمل أن تشاركوا في هذا الاستبيان بما أن رأيكم مهم. إذا أردتم الاستفسار عن أي سؤال أو عن أهمية الدراسة يمكن عمل ذلك قبل بدء المقابلة مع طفلكم/طفلتكم.

اسم المبحوث:_____ رقم هاتف المبحوث:_____

صف المبحوث:_____

1. المجيبة توافق على إجراء اللقاء ☐
2. المجيبة لا توافق على إجراء اللقاء ☐

توقيع الباحث: _____ التاريخ:_____

Annex2

Al-Quds Institute for Health Research and Nutrition

Al-Quds University

Rapid Nutritional Assessment Questionnaire

for School Aged Children in East Jerusalem

Section One:

1-1 **Questionnaire #:** ☐☐☐☐

1-2 **Student name:**_____

1-3 **Gender:** Male ☐ Female: ☐

1-4 **Date of Birth:** _____/_____/_____

1-5 **Student Telephone #:**_____

1-6 **School name:**_____

1-7 **School address (area):**_____

1-8 **In what grade are you?**	
1. 6th grade	☐
2. 8th grade	☐
3. 10th grade	☐

Interview Report

The interview took place on: _____/____/____

Day of interview: 1 2 3 4 5 6 7

Started at: ____:____ **Ended at:** ____:____

Was there a need to update the address? Yes ☐ No ☐

If yes, what is the new address? _____

Visit Schedule	Date
1st Visit	____/____/____
2nd Visit	____/____/____
3rd Visit	____/____/____

Section Two:

2-1 Now we are going to ask you about the people living with at home. Not everyone live with his/her parents. Sometimes children live with their father or their mother, and sometimes some children live in two houses or with two families. Please answer in LINE A what reflect your main home, and in LINE B if you have any additional home (Do NOT give answers in regards to your vacation Time).

Who lives with you at home? Put (✓) were appropriate

2-1-A **LINE A**			2-1-B **LINE B**		
Adults	Yes	No	Adults	Yes	No
1. Mother	☐	☐	1. Mother	☐	☐
2. Father	☐	☐	2. Father	☐	☐
3. Stepmother	☐	☐	3. Stepmother	☐	☐
4. Stepfather	☐	☐	4. Stepfather	☐	☐
5. Grandmother	☐	☐	5. Grandmother	☐	☐
6. Grandfather	☐	☐	6. Grandfather	☐	☐
7. Foster home	☐	☐	7. Foster home	☐	☐
8. I live with someone else	☐	☐	8. I live with someone else	☐	☐
Specify _____			Specify _____		
2-2-A Father			**2-2-B Mother**		
Does your father work?			Does your mother work?		
1. Yes	☐		1. Yes	☐	
2. No	☐		2. No	☐	
3. I don't know	☐		3. I don't know	☐	
4. I don't have a father or I don't meet him	☐		4. I don't have a mother or I don't meet her	☐	
2-3-A If Yes, where does he work (ex. hospital, bank, restaurant)_____			**2-3-A If Yes**, where does she work (ex. hospital, bank, restaurant)_____		
2-4-A What is his Job (ex. teacher, driver)_____			**2-4-B** What is her Job (ex. teacher, driver)_____		

2-5-A If No, why doesn't your father work?		2-5-B If No, why doesn't your mother work?	
1.	Sick, retired or university student ☐	1.	Sick, retired or university student ☐
2.	Looking for work ☐	2.	Looking for work ☐
3.	Take care of others, and the house ☐	3.	Take care of others, or housewife ☐
4.	I don't know ☐	4.	I don't know ☐

2-6 How do you describe your family economical status?	
1.	Very good ☐
2.	Good ☐
3.	Average ☐
4.	Not good ☐
5.	Not good at all ☐

2-7 Does your family own a car? (including work car)	
1.	No ☐
2.	Yes, one car ☐
3.	Yes, two care or more ☐

2-8 Is the room you sleep in for you alone?	
1.	Yes ☐
2.	No ☐

2-9 What is the number of computers you have at home?	
1.	We don't have a computer ☐
2.	One computer ☐
3.	Two computers ☐
4.	More than two computers ☐

2-10 During the last 12 months, how many times did you go out with your family on a relaxing vacation for more than one day?	
1.	None ☐
2.	One time ☐
3.	Two times ☐
4.	More than two times ☐

2-11 what is your father's level of education?			
1.	Illiterate ☐	5.	Vocational preparation (ex. Accounting degree) ☐
2.	Primary level ☐	6.	College/University ☐
3.	Preparatory level ☐	7.	Post graduate ☐
4.	Secondary level ☐		

2-12 what is your mother's level of education?			
1.	Illiterate ☐	5.	Vocational preparation (ex. Accounting degree) ☐
2.	Primary level ☐	6.	College/University ☐
3.	Preparatory level ☐	7.	Post graduate ☐
4.	Secondary level ☐		

Section Three:

3-1 24 hour food recall

Researcher Read: I will now ask you for details about everything you ate and drank yesterday.

<table>
<tr>
<td colspan="2">3-1 What did you eat from 4 a.m. yesterday _____until 4 a.m. today____? Specify everything you ate and drank in the house and out side of the house, including sweets and snacks, coffee, tea, soft drinks, alcoholic drinks etc.

If asked "Why 4a.m.?" read: Previous studies have shown that at 4a.m. it is possible to distinguish between one day of 24 hours and the next,"

Interviewer: Write each item in a separate row, and when the interviewee has finished, continue to question 3-2.</td>
<td></td>
<td>3-2 What time did you begin to eat /drink the _____?</td>
<td>Card no. 1

Where did you eat?
1. At home (home cooked food)
2. Home-(ready made /bought food)
3. At work-home- prepared food
4. At work- ready made/bought food
5. At work- cafeteria, dining room
6. Restaurant
7. Other(specify)</td>
</tr>
<tr>
<td></td>
<td>The quick list</td>
<td>√</td>
<td></td>
<td rowspan="27">Which meal?
1. Breakfast
2. Morning snack
3. Breakfast+ Lunch(Brunch)
4. Lunch
5. Afternoon snack
6. Lunch/Dinner combined
7. Dinner
8. Late night snack
9. Other (specify)</td>
</tr>
<tr><td>A</td><td></td><td></td><td></td></tr>
<tr><td>B</td><td></td><td></td><td></td></tr>
<tr><td>C</td><td></td><td></td><td></td></tr>
<tr><td>D</td><td></td><td></td><td></td></tr>
<tr><td>E</td><td></td><td></td><td></td></tr>
<tr><td>F</td><td></td><td></td><td></td></tr>
<tr><td>G</td><td></td><td></td><td></td></tr>
<tr><td>H</td><td></td><td></td><td></td></tr>
<tr><td>I</td><td></td><td></td><td></td></tr>
<tr><td>J</td><td></td><td></td><td></td></tr>
<tr><td>K</td><td></td><td></td><td></td></tr>
<tr><td>L</td><td></td><td></td><td></td></tr>
<tr><td>M</td><td></td><td></td><td></td></tr>
<tr><td>N</td><td></td><td></td><td></td></tr>
<tr><td>O</td><td></td><td></td><td></td></tr>
<tr><td>P</td><td></td><td></td><td></td></tr>
<tr><td>Q</td><td></td><td></td><td></td></tr>
<tr><td>R</td><td></td><td></td><td></td></tr>
<tr><td>S</td><td></td><td></td><td></td></tr>
<tr><td>T</td><td></td><td></td><td></td></tr>
<tr><td>U</td><td></td><td></td><td></td></tr>
<tr><td>Z</td><td></td><td></td><td></td></tr>
</table>

3-1 What did you eat from 4 a.m. yesterday _____until 4 a.m. today____? Specify everything you ate and drank in the house and out side of the house, including sweets and snacks, coffee, tea, soft drinks, alcoholic drinks etc. If asked "Why 4a.m.?" read: Previous studies have shown that at 4a.m. it is possible to distinguish between one day of 24 hours and the next," Interviewer: Write each item in a separate row, and when the interviewee has finished, continue to question 3-2.			**3-2** What time did you begin to eat /drink the _____?	Card no. 1 **Where did you eat?** 1. At home (home cooked food) 2. Home-(ready made /bought food) 3. At work-home- prepared food 4. At work- ready made/bought food 5. At work- cafeteria, dining room 6. Restaurant 7. Other(specify)
	The quick list	√		
A A				
B B				
C C				**Which meal?** **1. Breakfast** **2. Morning snack** **3. Breakfast+ Lunch(Brunch)** **4. Lunch** **5. Afternoon snack** **6. Lunch/Dinner combined** **7. Dinner** **8. Late night snack** **9. Other (specify)**
D D				
E E				
F F				
G G				
H H				
I I				
J J				
K K				
L L				
M M				

To the interviewer - read: There are foods and drinks which people may forget they ate or drank. . Try to remember if you forgot to mention any of these foods: hot drinks, cold drinks, alcoholic drinks, sweets, salty snacks, fruits, vegetables, bread, water.

To the interviewer - read: I would now like to ask you for additional details regarding the food and drinks that you mentioned. I will ask "where did you eat" and "which meal was it?" If you remember other foods,

tell me. When I ask you about the quantity you ate or drank, you can use the examples I suggest, the dishes in your house or the information on the wrapper/packet.

Food/Drink description.

To the interviewer – Transfer, from the Quick List the item letter to column 1, the hour to column 2, and name to column 5. Mark √ on the Quick list in the column near the item you've copied and move to columns 3 and 4 using card 2 . Complete columns 6,7 (q. 11 and q. 12) using the Food Guide.

Item	Hour	Where did you eat/drink this item?	What meal was it?	Item name	Food/drink description	What quantity did you eat/drink?
1	**2**	**3**	**4**	**5**	**6**	**7**
					1	
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					10	
					11	
					12	
					13	
					14	
					15	
					16	
					17	

Item	Hour	Where did you eat/drink this item?	What meal was it?	Item name	Food/drink description	What quantity did you eat/drink?
1	**2**	**3**	**4**	**5**	**6**	**7**
					18	
					19	
					20	
					21	
					22	
					23	
					24	
					25	
					26	
					27	
					28	
					29	
					30	
					31	
					32	
					33	
					34	
					35	
					36	

3-3 Was the amount you ate yesterday similar to the amount you usually eat?		
1.	Yes, the same	☐
2.	No, yesterday I ate less than usual	☐
3.	No, yesterday I ate more than usual	☐
4.	Don't know	☐

3-4 What is the main reason you ate a different amount yesterday to that you usually eat?		
1.	Diet	☐
2.	Vacation, trip, travel	☐
3.	Lack of time	☐
4.	Religious holiday	☐
5.	Family celebration, social occasion	☐
6.	Stress, boredom	☐
7.	Illness	☐
8.	Fasting	☐
9.	Other, specify: _____	☐

3-5 Measures of Nutrition status

School Children (11, 13, 15)			
Height (cm)	**Weight (Kg)**	**Hb (g/ dL)**	**BMI**

Section Four

Free-time Activities

4.1 How many hours per day do you usually watch television? Put a (✓) for answers for weekdays and another for weekends)

4-1-A Weekdays		Yes	No	**4-1-B Weekends**		Yes	No
1.	I don't watch TV	☐	☐	1.	I don't watch TV	☐	☐
2.	30 minutes per day	☐	☐	2.	30 minutes per day	☐	☐
3.	1 hour per day	☐	☐	3.	1 hour per day	☐	☐
4.	2 hours per day	☐	☐	4.	2 hours per day	☐	☐
5.	3 hours per day	☐	☐	5.	3 hours per day	☐	☐
6.	4 hours per day	☐	☐	6.	4 hours per day	☐	☐
7.	5 hours per day	☐	☐	7.	5 hours per day	☐	☐
8.	6 hours per day	☐	☐	8.	6 hours per day	☐	☐
9.	7 or more hours per day	☐	☐	9.	7 or more hours per day	☐	☐

4.2 How many hours per day do you usually do your school assignments, after the school time? Put a (✓) for answers for weekdays and another for weekends)

4-2-A Weekdays		Yes	No	**4-2-B Weekends**		Yes	No
1.	I don't do my assignments	☐	☐	1.	I don't do my assignments	☐	☐
2.	30 minutes per day	☐	☐	2.	30 minutes per day	☐	☐
3.	1 hour per day	☐	☐	3.	1 hour per day	☐	☐
4.	2 hours per day	☐	☐	4.	2 hours per day	☐	☐
5.	3 hours per day	☐	☐	5.	3 hours per day	☐	☐
6.	4 hours per day	☐	☐	6.	4 hours per day	☐	☐
7.	5 hours per day	☐	☐	7.	5 hours per day	☐	☐
8.	6 hours per day	☐	☐	8.	6 hours per day	☐	☐
9.	7 or more hours per day	☐	☐	9.	7 or more hours per day	☐	☐

4.3 How many hours per day do you usually use the computer? Put a (✓) for answers for weekdays and another for weekends)

4-3-A Weekdays		Yes	No	4-3-B Weekends		Yes	No
1.	I don't use the computer	☐	☐	1.	I don't use the computer	☐	☐
2.	30 minutes per day	☐	☐	2.	30 minutes per day	☐	☐
3.	1 hour per day	☐	☐	3.	1 hour per day	☐	☐
4.	2 hours per day	☐	☐	4.	2 hours per day	☐	☐
5.	3 hours per day	☐	☐	5.	3 hours per day	☐	☐
6.	4 hours per day	☐	☐	6.	4 hours per day	☐	☐
7.	5 hours per day	☐	☐	7.	5 hours per day	☐	☐
8.	6 hours per day	☐	☐	8.	6 hours per day	☐	☐
9.	7 or more hours per day	☐	☐	9.	7 or more hours per day	☐	☐

4-4 How do you describe your body?		
1.	Very underweight	☐
2.	Slightly underweight	☐
3.	About the right weight	☐
4.	Slightly overweight	☐
5.	Very overweight	☐

4-4 How do you describe your health?		
1.	Excellent	☐
2.	Very good	☐
3.	Good	☐
4.	Fair	☐
5.	Poor	☐

Section Five

5- 1 Physical Activities

Physical activities are activities which lead to fast heart beating and making you breath hard. These activities can be done during sports, school activities, when playing with fellow friends or during going to school. Example on such activities: basketball, soccer, running, swimming laps, fast bicycling, fast dancing or similar aerobics activities?

5-1-A On how many of the **past seven days** did you exercise or participate in physical activities for at least 60 minutes in total?							
0	1	2	3	4	5	6	7

5-1-B On how many of the **regular weeks** did you exercise or participate in physical activities for at least 60 minutes in total?							
0	1	2	3	4	5	6	7

Annex 3

Food Intake Booklet (FIB)

The use of food intake booklet in dietary surveys is generally recommended as essential, since they greatly reduce the frustration of respondents who had formerly searched for words to describe volume, size and weight of food. This FIB was used during all 24-hour recall.

Methodology for Dietary Analysis

Entering of data

For data entry, a template was created for each questionnaire using a database Program. The template defined the name (field name), the type (character or numeric) as well as the length (the maximum number of characters for the field) of each variable and for numeric variables, the number of decimal places. Each subject was represented on a single record, but provision was made for "multiple answer options" as appropriate. Experienced data entry staff keyed the data and the senior nutritionist then checked the entered data for any obvious errors, and a printout of the data was made. This printout, together with the original questionnaires was then sent to the senior project coordinator who checked the entered data manually, namely compared the data on the questionnaires with that of the printouts and marked any differences on the printouts with a red pen. The chief analyst then went through any discrepancies and corrected them. The data for the specific cluster was then added to the main database.

Nutrient Analysis

Food and beverages from the 24hr diet recall were matched to food composition data to calculate nutrient intake. The primary source of food composition information was the SurvNet Composition Database, which contains the composition of approximately 6,000 foods and was compiled by USDA. If a direct match with information in the SurvNet was not available and the frequency of use was high relative to other foods, additional nutrient composition data was sought from overseas database (British and Israeli) if applicable.

When a food or beverage could not be completely described by the respondent (for example the person had milk but did not know the type) it was matched to a composite of the various types of milk weighted to reflect use reported in the survey.

If a recipe could not be supplied for a mixed food item eaten it was matched to a standard recipe. Preparation of 'standard recipes' was carried out by examination of appropriate recipes from top selling Middle Eastern cookbooks. Modifications were made to standard recipe ingredients to correspond with frequent responses to the ingredient probe questions (e.g. type of fat, milk, yogurt and/or cheese used). These modified recipes were matched to mixed food items where the respondent, although unable to supply the entire recipe, had been able to give some ingredient information in response to the probe questions. The nutrient composition of these recipes, allowing for weight and nutrient loss in cooking, was calculated then.

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List of Abbreviations

24-h-RQ	24-Hour Recall
BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CSFII	Continuous Survey of Food Intakes of Individuals 1994-1996
DOP	Declaration of Principles
EDHS	The Egyptian Demographic and Health Survey
DOP	Date of Birth
FPNHANS2000	First Palestinian National Health and Nutrition Survey 2000
GS	Gaza Strip
Hb	Hemoglobin
ICH	Immunization and Child Health
IDA	Iron Deficiency Aneamia
IDD	Iodine Deficiency Disorder
IHI	Israeli Health Insurance
IMR	Infant Mortality Rate
MCHC	Mothers and Children Health Care
MMR	Maternity Mortality Rate
MOE	Ministry of Education
MSR	Multi Sector Review
MUFA	Mono Unsaturated Fatty Acid
NGOs	Non-governmental Organizations
ORS	Oral Rehydration Solution
PA	Palestinian Authority
PCBS	Palestinian Central Bureau of Statistics
PHC	Primary Health Care
PLO	Palestinian Liberation Organization
PMOH	Palestinian Ministry of health
PNA	Palestinian National Authority
PUFA	Poly Unsaturated Fatty Acid
RDA	Recommended Dietary Allowance
SD	Standard Deviation

SFA	Saturated Fatty Acid
SPSS	Statistical Program for Social Science
SS	Student Survey
TFR	Total Fertility Rate
UK	United Kingdom
UN	United Nations
UNGA	United Nation General Assembly
UNICEF	United Nation Children Fund
UNRWA	United Nations Relief and Working Agency
UNSCO	United Nations Office of the Special Coordinator in the Occupied Territories
UNSCOP	United Nations Special Committee on Palestine
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAD	Vitamin A Deficiency
WB	West Bank
WFP	World Food Programme
WHO	World Health Organization

ABSTRACT

Objective : To investigate the nutritional status (prevalence of aneamia and malnutrition) and dietary pattern of school aged children in East Jerusalem.

Study Significance : This study is the first comprehensive study ever conducted on school-aged children in East Jerusalem.

Design : Cross-sectional study.

Settings : Schools in East Jerusalem grades 6, 8 and 10 by school ownership.

Subjects : The sample size was 400 students of which 351 had 24-hour dietary recall and 317 had blood tests and 400 had their weight and height measured.

Study Tools : A scale and meter were used to measure the weight and height, 24-hour recall questionnaire and a food intake booklet were used to quantify the dietary intake and Hemocue machine were used for measuring hemoglobin level.

Data Collection : The sample was collected between April 2003-January 2004.

Results : **Anaemia:** The severe form of anaemia (<7 gm/dl) turned out to be not of public health significance among school aged children in East Jerusalem. As for moderate and mild forms of anaemia it was 0.95% and 19% respectively.

BMI: Underweight (cut off value ≤18.5) was 30% for males and 22% for females. Obesity level (cut off value ≥30) was 3.3% among males and 4.8% among females. Furthermore, 27% of those with income ≥ average were underweight.

Macronutrient: Overall East Jerusalem school aged children macronutrient intake was inadequate when compared to < 80% RDA.

Conclusion : Students in East Jerusalem are generally suffering from malnutrition especially from underweight. More attention should be focused on the improvement of their dietary intake.

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ملخص

الهدف : دراسة الوضع الغذائي (فقر الدم و سوء التغذية) والنمط الغذائي لطلبة المدارس في شرقي القدس.

ميزات الدراسة : يعتبر هذا البحث الخاص بطلبة المدارس في القدس الشرقية الأول من نوعه.

نوعية الدراسة : تم استخدام أسلوب العينة المسحية.

مجتمع الدراسة : طلبة مدارس في القدس الشرقية إن حجم العينة الكلي 400 طالب. لقد تم سؤال 351 عن سلوكهم الغذائي، وقد تم قياس نسبة الهيموجلوبين في الدم ل 317 طالب. وقد تم قياس الوزن والطول ل 400 طالب.

أدوات الدراسة : تم استخدام ميزان ومتر من أجل قياس الوزن والطول. أما بخصوص قياس كمية الغذاء فقد تم تعبئة استمارة 24 ساعة الماضية إضافة إلى كتيب مقادير الطعام. وتم قياس نسبة الهيموجلوبين في الدم بواسطة جهاز الهميكيو.

جمع العينات : تم جمع عينات الدراسة في الفترة ما بين نيسان 2003- كانون الثاني 2004

النتائج : **أنيميا**: إن الدراسة بينت أنه لا توجد مشكلة خاصة بالأنيميا الحادة (<7gm/dl) لدى طلبة المدارس في القدس الشرقية. إن الأنيميا المتوسطة تشكل 0.95% و الأنيميا البسيطة تشكل 19%.

مؤشر كتلة الجسم: لقياس سوء التغذية تم استخدام المعيار ≤ 18.5 لقياس الطلبة دون الوزن السوي حيث تبين أن 30% من الذكور و 22% من الإناث يعانون من ذلك. 27% من الطلبة ذوي الدخل المعتدل وأعلى يعتبرون دون الوزن السوي. أما المعيار الخاص بالسمنة ≤ 30 فلقد أظهرت النتائج أن 3.3% من الذكور و 4.8% من الإناث يعانون من السمنة.

المكونات الرئيسة للطعام المأكول: بشكل عام إن طلبة المدارس في القدس الشرقية يحصلون على نسبة غير كافية من المكونات الرئيسة للطعام المتناول والتي تشكل < 80% من المخصصات الغذائية الموصى بها.

الخاتمة : بشكل عام إن طلبة المدارس في القدس الشرقية يعانون من سوء في التغذية خاصة دون الوزن السوي. لذا يجب زيادة التركيز على تحسين المخصصات الغذائية.

التمويل المالي : لقد تم تمويل الدراسة من قبل معهد القدس للبحوث الصحية والتغذية في جامعة القدس.