

**University of Crete**



**Faculty of Medicine**

**Department of Social Medicine**

**Ph.D. Thesis**

**Η ΠΑΧΥΣΑΡΚΙΑ ΚΑΙ ΟΙ ΑΚΟΥΣΙΟΙ ΤΡΑΥΜΑΤΙΣΜΟΙ ΣΕ ΠΑΙΔΙΑ  
ΣΧΟΛΙΚΗΣ ΗΛΙΚΙΑΣ ΣΤΗΝ ΠΑΛΑΙΣΤΙΝΗ: ΕΠΙΛΕΓΜΕΝΕΣ  
ΜΕΛΕΤΕΣ ΑΠΟ ΤΗΝ ΕΡΕΥΝΑ ΓΙΑ ΤΙΣ ΣΥΜΠΕΡΙΦΟΡΕΣ ΠΟΥ  
ΣΥΝΔΕΟΝΤΑΙ ΜΕ ΤΗΝ ΥΓΕΙΑ ΤΩΝ ΕΦΗΒΩΝ-ΜΑΘΗΤΩΝ  
(HBSC/WHO)**

**OBESITY AND UNINTENTIONAL INJURIES AMONG  
PALESTINIAN CHILDREN: SELECTIVE STUDIES FROM THE  
HEALTH BEHAVIOR FOR SCHOOL-AGED CHILDREN  
(HBSC/WHO) SURVEY**

**Christine Jildeh, B.Sc., MPH., MA**

**Heraklion 2013**

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Selective studies from the Health Behavior for School-Aged  
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**Christine Jildeh, B.Sc., MPH., MA**

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1. Anastas **PHILALITHIS**, Professor of Social Medicine (Supervisor)
2. Nikos **TZANAKIS**, Associate Professor of Clinical Epidemiology
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# DEDICATION

*I dedicate this thesis to*  
*My mother and father, Nariman & Pierre*  
*My Sisters Alice, Aida and Nardine*  
*My brothers Issa and Peter*  
*My mother and father in law, Maria & Panayoti*  
*My brother in law, Asterios*  
*My nephews Pierre, Fahed, Christian, Pierre and Adam*  
*My husband, Sokratis*  
*for their constant support and unconditional love.*  
*I love you all dearly.*



## LIST OF PUBLICATIONS

1. **Obesity in Mediterranean region (1997–2007): a systematic review**, C. Papandreou<sup>1</sup>, T. Abu Mourad, C. Jildeh, Z. Abdeen, A. Philalithis and N. Tzanakis, *obesity reviews* (2008) 9, 389–399
2. **Assessing the nutritional status of Palestinian adolescents from East Jerusalem: a School-based Study 2002/2003**, C. Jildeh, T. Abu Mourad, C. Papandreou, A. Philalithis, C. Hatzis, A. Kafatos- Emeritus, R. Qasrawi, Z. Abdeen, J Trop Pediatr. 2010 Jul 31
3. **Unintentional Injuries among School- Aged Children in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)** Christine Jildeh, Ziad Abdeen, Haleama Al Sabbah and Anastas E. Philalithes, *International Journal of Population Research*, Volume 2013, Article ID 629159, 7 pages, <http://dx.doi.org/10.1155/2013/629159> , accepted 19<sup>th</sup> February 2013
4. **Labor and Related Injuries among Schoolchildren in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)**, Christine Jildeh, Ziad Abdeen, Haleama Al-Sabah, Christopher Papandreou, Ibrahim Ghannam, Nancy Weller and Anastas Philalithis, *International Journal of Health Planning and Management*, Accepted 23<sup>rd</sup> July 2013)



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**ABSTRACT**

**Introduction**

Children are vital to the nation's development. Over the years, evidence has shown that good physical and psychological health during childhood sets the stage for positive and healthy choices to be made during adulthood. Children have begun to be recognized not only for who they are today but for their future roles in creating families and powering the workforce. In order to reinforce this perspective, the Health Behavior of School Aged Children Project (HBSC) project was developed by researchers from England, Finland and Norway and was adopted by the WHO Regional Office for Europe in 1983. The goal of HBSC is to obtain data about adolescent behavior, concerning health, and to make this information available so as to enable the improvement of health services and programs for youth.

In Palestine, there is little literature about children's attitudes, behaviours, physical or psychological well-being. As a result, Al-Quds University decided in 1995 to join the HBSC project in an effort to adequately assess and monitor the health of Palestinian children. The purpose of this thesis is to discuss two themes of the HBSC project in Palestine 1- nutrition and obesity, 2- unintentional injuries. While theme one aims to determine the distribution of obesity in the Mediterranean region in general and assess the nutrition status of Palestinian school aged children in Jerusalem in particular, theme two aims to describe nonfatal injuries and documenting the prevalence and nature of unintentional injuries.

## **Methodology**

To achieve the purpose for theme one, a meta-analysis was conducted for 102 articles cited during the period (1997–2007) in Medline database (for 17 Mediterranean countries) searched during the summer of 2007 using the word 'obesity' and its related keywords. As the scope of the study was to assess the prevalence of obesity in the Mediterranean region, the continents were used as the unit of analysis rather than countries. Also data from the 2002/2003 school-based cross-sectional study targeting 313 adolescents at random from both public and private schools in Jerusalem was analyzed. A previously validated and reliable questionnaire was administered through interviews that included anthropometric and hemoglobin measurements, 24-h dietary intake recall and a physical activity.

In theme two, data from the 2006 "Palestinian Health Behaviour in School-aged Children" (HBSC) cross-sectional survey was used. Students of grades 6, 8, 10, and 12 self-completed a modified version of the international HBSC questionnaire, resulting in 15,963 students (47.3% boys and 52.7% girls) included in this study (56.9% from the West Bank and 43.1% from Gaza). From the total selected children, 6458 (40.8%) completed an optional package related to labor.

## Results

Analysis for theme one showed that adults were more obese than children in all Mediterranean continents and in different levels of income. The prevalence of obesity among European children was higher than among Asians. In Jerusalem, the nutrition assessment had shown that being overweight (24.3%) or obese (9.9%) coexisted with being underweight (4.8%) and/or anemic (23.3%). Less than one in four (22.4%) of the Palestinian students reported engaging in physical activity more than 5 days a week with boys being more physically active ( $P < 0.01$ ). The majority of children met less than 80% of the recommended daily allowances (RDA) for most micronutrients. Although malnutrition was evident in the sample, 80% of children rated their health as excellent with boys reporting themselves as healthier ( $p < 0.01$ ).

Analysis for theme two showed that injury is a leading cause of poor health among Palestinian children across the country. Of the total 15,963 adolescents, 47.6% were injured, boys (53.5%) being statistically more likely to be injured than girls (42.1%) ( $P < 0.001$ ). The prevalence of those injured more than once decreased by age and was also found significantly higher in boys than in girls (27.3% and 17.9%, resp.) ( $P < 0.001$ ). Children living in low family affluence scale (FAS) showed significantly lower ratios of injuries than those living in moderate and high FAS families ( $P < 0.001$ ). Injuries while biking were significantly higher among boys (46.3%) than girls (41.7%) ( $P < 0.001$ ), and injuries while walking/running were more prevalent among girls (32.5%) than boys (28.0%) ( $P < 0.001$ ). Approximately 73.8% of the students who filled the optional package reported working during the last 12 months, from whom 79.1% sustained a work related injury. Work injuries were significantly higher among boys, younger children, children enrolled in UNRWA Schools and living in Gaza Strip ( $P < 0.05$ ). Children working more than 3 hours a day were more likely, by a factor of 1.73 (95% CI, 1.53-1.95), to experience injuries than those working less than 3 hours a day. About half of the

children worked in retail trade (51.5%), while 20% worked in agriculture and 11.4% were in the field of cleaning (11.4%). Injury types were related to the type of work performed.

## **Conclusion**

In Palestine, the extent, risk factors, and preventability of child obesity and how they relate to injuries are not extensively appreciated. Findings from this thesis fill a recognized void in the Palestinian adolescent health literature, in that it provides new information about their eating habits and risk of injuries. It is hoped that the results of the present study can provide guidelines for designing awareness and school education programs that encourage healthy dietary habits combined with physical activity. As well as the development of a National Injury Prevention and Intervention Programs aimed at enhancing the safety of Palestinian adolescents.



ΙΑΤΡΙΚΗ ΣΧΟΛΗ  
ΤΟΜΕΑΣ ΚΟΙΝΩΝΙΚΗΣ ΙΑΤΡΙΚΗΣ  
ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

**Η ΠΑΧΥΣΑΡΚΙΑ ΚΑΙ ΟΙ ΑΚΟΥΣΙΟΙ ΤΡΑΥΜΑΤΙΣΜΟΙ ΣΕ ΠΑΙΔΙΑ  
ΣΧΟΛΙΚΗΣ ΗΛΙΚΙΑΣ ΣΤΗΝ ΠΑΛΑΙΣΤΙΝΗ: ΕΠΙΛΕΓΜΕΝΕΣ ΜΕΛΕΤΕΣ ΑΠΟ  
ΤΗΝ ΕΡΕΥΝΑ ΓΙΑ ΤΙΣ ΣΥΜΠΕΡΙΦΟΡΕΣ ΠΟΥ ΣΥΝΔΕΟΝΤΑΙ ΜΕ ΤΗΝ  
ΥΓΕΙΑ ΤΩΝ ΕΦΗΒΩΝ-ΜΑΘΗΤΩΝ (HBSC/WHO)**

**Christine Jildeh, B.Sc., MPH., MA**

**ΠΕΡΙΛΗΨΗ**

**ΕΙΣΑΓΩΓΗ**

Τα παιδιά είναι ζωτικής σημασίας για την ανάπτυξη του έθνους. Με τα χρόνια, αποδείχθηκε ότι η καλή σωματική και ψυχική υγεία κατά την παιδική ηλικία θέτει τις βάσεις για την καλή υγεία μετά την ενηλικίωση. Τα παιδιά έχουν αρχίσει να αναγνωρίζονται όχι μόνο για αυτό που είναι σήμερα, αλλά και για τους μελλοντικούς τους ρόλους στη δημιουργία οικογενειών και για την τροφοδότηση του εργατικού δυναμικού. Για την ενίσχυση αυτής της προοπτικής, αναπτύχθηκε η έρευνα -“Υγεία της συμπεριφοράς παιδιών σχολικής ηλικίας” - (HBSC) από ερευνητές από την Αγγλία, τη Φινλανδία και τη Νορβηγία και εγκρίθηκε από το Περιφερειακό Γραφείο Ευρώπης του Παγκόσμιου Οργανισμού Υγείας Ευρώπη το 1983. Ο στόχος της μελέτης HBSC είναι να συλλεχθούν δεδομένα σχετικά με τις συμπεριφορές υγείας των εφήβων και να καταστούν οι πληροφορίες διαθέσιμες, ώστε να είναι δυνατή η βελτίωση των υπηρεσιών υγείας και των προγραμμάτων για τη νεολαία.

Στην Παλαιστίνη, υπάρχει φτωχή βιβλιογραφία σχετικά με τις στάσεις, τις συμπεριφορές, τη σωματική και ψυχική ευεξία των παιδιών. Με σκοπό να καλύψει αυτό το κενό), το Πανεπιστήμιο Al-Quds αποφάσισε το 1995 να ενταχθεί στο έργο HBSC, σε μια προσπάθεια να εκτιμήσει και να παρακολουθήσει επαρκώς την υγεία των παιδιών της Παλαιστίνης.

Η παρούσα μελέτη συζητάει δύο θέματα του προγράμματος HBSC, 1) Διατροφή και Παχυσαρκία και 2)- Ακούσιοι τραυματισμοί.

Το πρώτο θέμα αποσκοπεί στον καθορισμό της κατανομής της παχυσαρκίας στην περιοχή της Μεσογείου γενικά, και στην αξιολόγηση της κατάστασης της διατροφής των παιδιών της Παλαιστίνης σχολικής ηλικίας ιδίως στην Ιερουσαλήμ. Το δεύτερο θέμα αποσκοπεί στην περιγραφή των μη θανατηφόρων τραυματισμών.

## ΜΕΘΟΔΟΛΟΓΙΑ

Για την επίτευξη του πρώτου σκοπού, πραγματοποιήθηκε κατά τη διάρκεια του καλοκαιριού του 2007 μετα-ανάλυση 102 άρθρων τα οποία δημοσιεύτηκαν κατά το χρονικό διάστημα 1997-2007 στην βάση δεδομένων 'Medline (και αφορούν 17 χώρες της Μεσογείου) χρησιμοποιώντας την λέξη «παχυσαρκία» και σχετικές λέξεις-κλειδιά. Επίσης, αναλύθηκαν δεδομένα από cross-sectional μελέτη 2002-2003 η οποία είχε στόχο 313 εφήβους τυχαία επιλεγμένων από δημόσια και ιδιωτικά σχολεία στην Ιερουσαλήμ. Χρησιμοποιήθηκε ερωτηματολόγιο που είχε προηγουμένως σταθμιστεί για την αξιοπιστία και την εγκυρότητα του και περιλαμβάνει εκτός από τη συνέντευξη, ανθρωπομετρικά δεδομένα και δεδομένα αιμοσφαιρίνης, 24ωρη διαιτητική ανάκληση και ένα ερωτηματολόγιο φυσικής δραστηριότητας.

Στο δεύτερο θέμα, χρησιμοποιήθηκαν τα δεδομένα της cross-sectional μελέτης "Palestinian Health Behavior in School-aged Children" (HBSC). Οι μαθητές των τάξεων 6, 8, 10, και 12 αυτοσυμπλήρωσαν μια τροποποιημένη έκδοση του διεθνούς ερωτηματολογίου HBSC, με αποτέλεσμα 15.963 μαθητές (47,3% αγόρια και 52,7% κορίτσια) να περιλαμβάνονται σε αυτή τη μελέτη (56,9% από τη Δυτική Όχθη και 43,1% από τη Γάζα). Από το σύνολο των επιλεγμένων παιδιών,

6458 (40,8%) συμπλήρωσαν ένα προαιρετικό πακέτο (ερωτηματολόγιο) σχετιζόμενο με την εργασία.

## ΑΠΟΤΕΛΕΣΜΑΤΑ

Η μετά-ανάλυση κατέδειξε ότι οι ενήλικες εμφάνισαν μεγαλύτερα ποσοστά παχυσαρκίας σε σχέση με τα παιδιά σε όλες τις ηπείρους στη Μεσόγειο ανεξάρτητα από τα διαφορετικά επίπεδα εισοδήματος. Ο επιπολασμός της παχυσαρκίας μεταξύ των παιδιών στην Ευρώπη ήταν υψηλότερος από ό, τι μεταξύ των Ασιατών.

1) Στην Ιερουσαλήμ, η αξιολόγηση έδειξε ότι η κατάσταση των υπέρβαρων (24,3%) ή παχύσαρκων ατόμων (9,9%) συνηπήρχε με λιποβαρείς (4,8%) και/ή αναιμικές καταστάσεις (23,3%). Λιγότερο από ένας στους τέσσερις (22,4%) των Παλαιστινίων φοιτητών δήλωσαν συμμετοχή σε κάποια σωματική δραστηριότητα περισσότερο από 5 ημέρες την εβδομάδα, με τα άρρενα άτομα να είναι σωματικά πιο δραστήρια ( $P < 0,01$ ). Η πλειοψηφία των παιδιών προσλαμβάνει λιγότερο από το 80% της συνιστώμενης ημερήσιας πρόσληψης (RDA) για τα περισσότερα μικροθρεπτικά συστατικά. Παρά το γεγονός ότι ο υποσιτισμός ήταν εμφανής στο δείγμα, το 80% των παιδιών βαθμολόγησαν την υγεία τους ως εξαιρετική, με τα άρρενα άτομα να χαρακτηρίζουν την υγεία τους ως βέλτιστη ( $P < 0,01$ ).

2) Η ανάλυση του δεύτερου θέματος ανέδειξε ότι το τραύμα είναι η κύρια αιτία της κακής υγείας μεταξύ των Παλαιστινίων παιδιών σε όλη τη χώρα. Από το σύνολο των 15.963 εφήβων, το 47,6% τραυματίστηκαν, με τα άρρενα άτομα (53,5%) να είναι στατιστικά πιο επιρρεπή σε τραυματισμούς σε σχέση με τα θήλεα (42,1%) ( $P < 0,001$ ). Το σύνολο των ατόμων με περισσότερους από ένα τραυματισμό, φάνηκε να μειώνεται κατά ηλικία και βρέθηκε επίσης σημαντικά υψηλότερη στα αγόρια παρά στα κορίτσια (27,3% και 17,9%, αντίστοιχα  $P < 0,001$ ). Παιδιά οικογενειών με χαμηλό Δείκτη Οικογενειακής Ευμάρειας (*Family Affluence Scale* - FAS) παρουσίασαν σημαντικά χαμηλότερες αναλογίες τραυματισμών από εκείνα που ζουν σε οικογένειες με μέτρια ή υψηλή FAS ( $P < 0,001$ ). Ο αριθμός των τραυματισμών κατά την διάρκεια ποδηλασίας ήταν σημαντικά μεγαλύτερος στα αγόρια (46,3%) συγκριτικά με τα κορίτσια (41,7%)



( $P<0,001$ ), ενώ ο αριθμός των τραυματισμών κατά το περπάτημα/τρέξιμο ήταν μεγαλύτερος στα κορίτσια (32,5%) σε σχέση με τα αγόρια (28,0%) ( $P<0,001$ ).

3) Περίπου το 73,8% των μαθητών οι οποίοι συμπλήρωσαν το προαιρετικό πακέτο ανέφεραν ότι εργάζονται κατά τη διάρκεια των τελευταίων 12 μηνών, από τους οποίους το 79,1% δήλωσαν ότι υπέστησαν κάποιο τραυματισμό που σχετίζεται με την εργασία την οποία εκτελούσαν. Τα εργατικά ατυχήματα ήταν σημαντικά περισσότερα στα αγόρια, σε παιδιά μικρότερης ηλικίας, και σε παιδιά που είναι εγγεγραμμένα σε σχολεία της UNRWA και ζουν στη Λωρίδα της Γάζας ( $P<0.05$ ). Τα παιδιά που εργάζονται περισσότερο από 3 ώρες/ημέρα είχαν περισσότερες πιθανότητες κατά ένα συντελεστή 1,73 (95% CI,1.53-1.95) να υποστούν κάποιο τραυματισμό από αυτούς που εργάζονται λιγότερο από 3 ώρες/μέρα. Περίπου τα μισά από τα παιδιά εργάστηκαν στο λιανικό εμπόριο (51,5%), τη γεωργία (20,0%) και τον καθαρισμό (11,4%). Το είδος του τραυματισμού είχε άμεση σχέση με το είδος της εκτελούμενης εργασίας.

## **ΣΥΜΠΕΡΑΣΜΑ**

Στην Παλαιστίνη δεν εκτιμούνται ιδιαίτερα ο βαθμός, οι παράγοντες κινδύνου και οι προβλέψεις της παιδικής παχυσαρκίας και των τραυματισμών. Ευρήματα της παρούσας μελέτης καλύπτουν ένα κενό στη βιβλιογραφία για την εφηβική υγεία στην Παλαιστίνη, παρέχοντας νέες πληροφορίες σχετικά με τις διατροφικές συνήθειες των εφήβων και τον κίνδυνο τραυματισμού. Ελπίζουμε ότι τα αποτελέσματα της παρούσας μελέτης μπορούν να παρέχουν αρχικά κατευθυντήριες οδηγίες για το σχεδιασμό ενημερωτικών και εκπαιδευτικών προγραμμάτων, τα οποία ενθαρρύνουν υγιεινές διατροφικές συνήθειες σε συνδυασμό με τη σωματική δραστηριότητα. Επιπλέον μπορούν να συμβάλλουν στην ανάπτυξη ενός «Εθνικού Προγράμματος Παρέμβασης και Πρόληψης Τραυματισμών» με στόχο την ενίσχυση της ασφάλειας των Παλαιστινίων εφήβων.

# CHAPTER 1

## 1.1 Introduction

Healthy children and youth development begins long before birth and is one of the key determinants for health and well-being throughout one's life. Health in adolescence is the result of interactions between prenatal and early childhood development and the specific biological and social-role changes that accompany puberty, shaped by social determinants and risk and protective factors that affect the uptake of health-related behaviours. A healthy child is the one who takes these factors and joins them together and thrives through each developmental stage and is positioned to reach his or her potential in adulthood.

Young people are usually looked upon as healthy, and for that reason, few attempts have been made to analytically measure their health. Yet adolescence and young adulthood concur with major changes in health problems and determinants of health in later life (Kleinert 2007; Patton et al. 2007; Sawyer et al. 2012, Viner et al. 2012)

A study by Patton in 2012 illustrates wide international disparities in almost all aspects of adolescent health. These differences exist both between and within regions. Young people in sub-Saharan Africa got the poorest regional health profiles where mortality, HIV infection, and role transitions linked to health risk (eg, early childbirth) were high. Other regional variances were clear in Latin America where high death rates were due to violence, suicide and traffic related injury. Evidence shows that risks for later life non-communicable diseases are increasing rapidly worldwide, with the highest rates of tobacco use and overweight persons accompanied by the lowest rates of physical activity, predominantly in adolescents living in low and middle-income countries (Patton et al. 2012).

Due to the misperception of children being always healthy, the definition of children's health has received little consideration separate from that of adults. Although views of adult health have evolved from a focus on morbidity and mortality to consider broader aspects of health such as the mental, physical and social well-being, considerations specific to children have generally been excluded.

As a result, a group of researchers from England, Finland and Norway adopted the WHO health definition in developing and implementing a shared research protocol to investigate the health of children. This research protocol, (Currie et al. 2011) which addresses the health behaviour for school aged children, (HBSC) emphasized that understanding these children's attitudes, behaviours, physical and psychological well-being, and the factors that impact them, is essential for the development of effective health education and school health promotion policy, programs, and practice. By 1983, the HBSC study was adopted by the WHO Regional Office for Europe as a collaborative study. Currently, 43 countries and regions across Europe, North America and Israel have joined the HBSC Study.

Since then and every four years, the HBSC collects a random representative sample of school aged children aged 11, 13 and 15 years using a standard methodology detailed in the HBSC 2009/2010 international study protocol (Currie et al. 2011). Children in these age groups are growing up both physically and emotionally. As a result, they face many challenges including changing social relationships with family and friends; developing and planning their academic and future opportunities. In short, this is the period when children start making independent decisions and developing unique behaviours that may continue into adulthood, influencing the development of their physical and mental health. Here they may also acquire compromising behaviours such as tobacco use, unhealthy diet, physical inactivity, alcohol use, bullying and injuries. In addition to the above measured behaviours, the HBSC measures positive adolescent developmental outcomes such as happiness, life satisfaction, emotional well-being, relationships with others,

attachment and connectedness to school, and student participation in curricular and extra-curricular activities (Currie et al. 2008). These items have been developed and validated by cross-national teams of researchers since the inception of the study in the mid-1980s (Currie et al. 2008).

The questionnaire for the survey was developed using the WHO international HBSC questionnaire (2001-2002) including all mandatory HBSC questions (Currie et al. 2002). The questionnaire was double cross translated to Arabic; it was tested in two independent preliminary studies using in-class administration as well as focus-group discussions to demonstrate reliability and validity prior to the administration of the nationally represented full survey.

In addition to the mandatory variables addressed in the survey (demographics, general health, well-being, family and peer relationships, school environment, exercise and leisure-time activities, diet, injuries, smoking, exposure to political violence, and mental health) (Harel and Abdeen 2006; Abdeen and Qasrawi 2007; Harel and Abdeen 2008), the questionnaire also contained optional packages which focused on one of the above mentioned fields. This part of the questionnaire changes over time and each participating country is free to choose from the list of topics.

In Palestine, children constitute 52.6% of the population (PCBS 2004) and although they make up to more than half of the total Palestinian population, little attention has been given to study their health.

Consequently, in 1995 the regional HBSC project was initiated. It was collaboration between research teams at Universities and NGO's in Gaza, the West Bank and Israel. This regional project focused its attention on developing a sustainable multi-year study and monitoring system. Through the means of regional workshops, periodic meetings and daily ongoing phone and e-mail connections, all participants have been collaborating in the development of the proposed project, from its conceptualization, through the

development of the research proposals, the implementation of a small pre-test that was carried out in late spring 1997. The nature of the collaboration was such that all research teams were actively involved in all stages of the project. As a result of the groundwork, this cooperative effort was represented as the first of its kind in the growing family of HBSC survey countries.

In 1998, there was the first collection of pilot data from four populations in the region. The Pilot study focused on the establishment of a scientifically sound methodology and a topic-relevant set of focus areas to enable the implementation of a Middle East Regional HBSC Cross-Cultural Survey. Since then, Palestine has been applying the HBSC surveys.

**The present study focuses on two HBSC themes, 1- nutrition and obesity; and 2- injuries using the following articles:**

## **1.2 Theme one: Nutrition and Obesity**

The Mediterranean region constitutes an area formed by sea and land that covers about 2.5 million km<sup>2</sup>. This area includes three continents (Europe, Africa, Asia), which in turn contain several countries that possess a seashore of the Mediterranean Sea (Wikipedia website accessed July 2007). According to the level of economic development, Mediterranean countries vary from low- to high-income countries (World Bank 1998; World Bank 2000; World Bank 2002; World Bank 2003; World Bank 2004; World Bank 2005; World Bank 2006; World Bank 2007). Other differences existing among these countries are racial and cultural ones (religion, language, habits and others) (Otranto et al. 2006). Although continents around the world embody many differences, they still have a few things in common. Over the last decade, the prevalence of obesity has risen in both developed and developing countries affecting both children and adults (Newbold 2007; Lobstein 2003; Guilbert 2003). Obesity, which is an abnormal or excessive fat accumulation to the extent that health is impaired (WHO 2006), has been found to be

associated with various diseases such as hypertension (Hubert et al. 1983), myocardial infarction (Piegas et al. 2003), stroke (Walker et al. 1996), diabetes mellitus (Harris et al. 1998), different types of cancer (Ceschi et al. 2007) and sleep apnoea syndrome (Resta et al. 2001). It is clear that obesity does not discriminate between geographical location, economic level, sex and age.

Evidence from many studies from developing countries have shown that adolescents received little attention regarding their nutrition (Kruz et al. 1996) and suggests that their intake of several essential dietary nutrients are not meeting the recommended daily allowances, whereas the intake of fat exceeds the recommendations (Garipagaoglu et al. 2008).

In Palestine, dietary habits and nutritional status of pre-school children, non-pregnant women (aged 15–49 years) and adults (aged 18–64 years) have been studied extensively, while little nutritional assessment has been paid to adolescents (Medhi et al. 2007; Abdeen et al. 2003; Sabbah et al. 2007).

Assessing the nutritional status of children is a widely used method to monitor and evaluate their health. Satisfactory dietary intake and consequently good nutritional status is important for the physical and mental development during the paediatric years. Children gain up to 50% of their adult weight during this developmental stage. They also develop more than 20% of their height and 50% of their adult skeletal mass. Children at this age and who reach their final height malnourished are exposed to serious health problems in the short and long terms (Tse et al. 1989; Abudayya et al. 2007; Medhi et al. 2007).

This thesis will give more information about this theme through the following articles:

1. **Obesity in Mediterranean region (1997–2007): a systematic review**, C. Papandreou<sup>1</sup>, T. Abu Mourad, C. Jildeh, Z. Abdeen, A. Philalithis and N. Tzanakis, *obesity reviews* (2008) 9, 389–399
2. **Assessing the nutritional status of Palestinian adolescents from East Jerusalem: a School-based Study 2002/2003**, C. Jildeh, T. Abu Mourad, C. Papandreou, A. Philalithis, C. Hatzis, A. Kafatos- Emeritus, R. Qasrawi, Z. Abdeen, J Trop Pediatr. 2010 Jul 31

### **1.3 Theme two: Unintentional Injuries**

According to WHO, injuries among children and adolescents are the world's leading cause of morbidity and mortality. They are responsible for 950,000 global deaths every year from which at least 60 percent are attributed to unintentional causes (Peden 2008). Many studies have focused on the typology of injuries and their socio-economic status correlates (Moloch et al. 2006; Pickett et al. 2005) and particular types of injuries. However, the differences such as the extent, pattern, distribution, risk, and determinants between the intentional and unintentional home, school and road related childhood, and young adulthood injury hazards are not well understood (Milton 2011).

Although child injuries are considered a huge public health burden, several studies have shown that 71–95% of injuries could be prevented (Bergman and Rivara 1991; Onwuachi-Saunders et al. 1999). In developed countries such as Australia, Sweden, Britain, and Canada, injury rates have been reduced by up to 50% over the past three decades (Hyder et al. 2009). In developing countries, studies have been largely limited to hospital-based information which provides information on severe injuries (Bartlett 2002; Razzak et al. 2004).

A 2008 report about the incidence of home accidents among Palestinian and Israeli communities stated that falls were the most common cause of injury reported by parents surveyed (35% in the Palestinian community and 31% in the Bedouin community); the majority of these accidents occurred among boys (60% in the Bedouin community and 70% in the Palestinian community) with the yard, living room, and kitchen as places with the greatest number of accidents (Raanan et al. 2008). Another main site of accidents for the Palestinian population was the stairs—a site not relevant in the Bedouin homes. In the Bedouin community, burns represented an equal proportion of injuries to falls, significantly higher than the proportion found in the Palestinian survey (31% versus 11%) or in the international literature. Analysis of the circumstances of these accidents reveals that most were related to the use of an open fire for cooking and heating, which are common to the Bedouin lifestyle (Raanan et al. 2008). The Palestinian Ministry of Health (PMOH) reported that in 2004 accidents were the leading cause of death for children aged 1–4 and 5–19 years with a proportion of 24.2%, and 29.2%, respectively of the total deaths (PMOH 2005).

Furthermore, it was noticed that Palestinian children suffer from work related injuries. According to the Palestinian Center Bureau of Statistics report, the documented employed children was 5.5% (n=33,298), of whom 38.4% were not enrolled in schools (PMOH 2005). The study indicated that 24.0% of these youth worked in the commercial sector including restaurants, 20.0% in mining, quarries and manufacturing industries, 30.4% in agriculture, and 18.0% in construction. The percentage of children who worked for more than 6 hours a day was 73.2% (PCBS 2001). Currently, it is estimated that about 40,000 children under 18 are engaged in some form of labor activity in Palestine (PCBS 2006).



More details about this HBSC topic will be presented in the following articles:

1. **Unintentional Injuries among School-Aged Children in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)**  
*Christine Jildeh*, Ziad Abdeen, Haleama Al Sabbah and Anastas E. Philalithes, International Journal of Population Research, Volume 2013, Article ID 629159, 7 pages, <http://dx.doi.org/10.1155/2013/629159> , accepted 19<sup>th</sup> February 2013
  
2. **Labor and Related Injuries among Schoolchildren in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)**,  
*Christine Jildeh*, Ziad Abdeen, Haleama Al-Sabah, Christopher Papandreou, Ibrahim Ghannam, Nancy Weller and Anastas Philalithis, International Journal of Health Planning and Management, Accepted 23<sup>rd</sup> July 2013)

# CHAPTER 2

## 2.1 Goal

The purpose of this thesis is to shed light on two of the HBSC survey themes (1- nutrition and obesity, 2- unintentional injuries). To achieve this purpose, a meta-analysis study was conducted, and HBSC data for the year 2002/2003 and the year 2006 was used.

## 2.2 Objectives

The specific objectives for this thesis are to:

1. Determine the prevalence and distribution of obesity in the Mediterranean region over the last decade divided by geographical location, income, age and sex.
2. Assess the nutritional status of Jerusalemite school children during puberty by applying anthropometric measurements, biochemical test, dietary intake estimation and lifestyle assessment.
3. Estimate the prevalence rate of injuries among school aged children in Palestine for the year 2006.
4. Examine the severity of injuries among Palestine children for the year 2006.
5. Pinpoint the settings in which injuries among children in Palestine occur.
6. Identify the activity context of injury events occurring to Palestinian adolescents.
7. Compare the results of this study with studies from other countries which used similar type of research and target group.
8. Document the prevalence and nature of work related injuries among schoolchildren.
9. Identify socio-demographic factors which predict work related injuries.
10. Raise awareness about the magnitude, risk factors and impacts of obesity and injury on Palestinian school aged children.

In view of the above, our study investigated the following research questions:

1. What are the factors (geographical, economic, sex and age) that either separately or jointly act as best predictors of the variation of obesity prevalence in the Mediterranean region?
2. Are there any socio-demographic factors that contribute to malnutrition among Palestinian school aged children?
3. Are there any socio-demographic factors that impact the prevalence and severity of injuries among Palestinian school aged children?

## CHAPTER 3

### 3.1 Methodology

This chapter summarizes the methodologies used in the two themes of this Ph.D. thesis. More details on the methodologies and their references are found within the articles.

To ensure statistical accuracy, small frequencies were excluded. The study was based on Medline interface (PubMed), an online bibliographic database that includes more than 10 million references, abstracts of peer-reviewed journals (Lindberg 2000) and a wide range of databases, such as Cochrane. To ensure validity and reliability of the results and to avoid the probability of systematic bias, local reports were excluded.,

#### *3.1.a Theme one: Nutrition and Obesity*

A meta-analysis type of study was conducted to research previous studies that examine obesity in the Mediterranean region. The data was collected from only Medline database during the summer of 2007. A total of 102 studies met the research criteria (listed in Appendix 1 from paper I). As there were no available data for Monaco, Malta, Libya and Algeria, 17 of 21 countries were included in this study. As the scope of the study was to assess the prevalence of obesity in the Mediterranean region the continents were used as the unit of analysis rather than countries and therefore, repetition of previous studies was avoided. The SPSS statistical package version 15 was used. The datasets used for statistical analysis reached 172 because some articles were used for more than one dataset. Publications were distributed according to the date of surveys, number of articles and type of content; in addition, they were cross-tabulated. Obesity was measured based on sex, age groups, economic level and continent was presented. A non-parametric Mann–Whitney *U*-test was used to compare the obesity prevalence between two groups (sex, age and income). The one-sample *t*-test was used to compare the mean prevalence of obesity in the Mediterranean part of Europe with that of the expected prevalence in

Europe as a whole. Pearson product moment correlation coefficients were used to test the binary association between obesity prevalence and the associated independent variables such as age, sex and GNI. Multicollinearity was evaluated using two methods: factor inflation variance and binary correlation of the independent variables. The associated variables with the log-transformed obesity data ( $P < 0.1$ ) were subsequently used in the regression model. The latter model was conducted for each continent – Europe, Asia and Africa – separately. The stepwise with pairwise method exclusion was used. In addition, the standardized b-coefficient as well as  $t$ -value was presented and the adjusted  $R^2$  was used to test the explained variance.

As well, data from the HBSC project for the year 2002–03 was used. This East Jerusalem, school-based cross-sectional study, targeted 313 school aged children from public and private schools randomly. The selection of study population was multi-staged stratified and designed according to school ownerships, classes (6th, 8th, 10th grade) and gender. A previously validated and reliable questionnaire was administered through interviews that included anthropometric and hemoglobin measurements, 24-h dietary intake recall and physical activity. Each interview generally took about 20–45 min. Children were asked to describe the type and amount of food, as well as all beverages consumed during the day preceding the interview. To improve the accuracy of food descriptions, a food intake booklet, including pictures of Palestinian food, was used to define amounts when appropriate. The Statistical Package for Social Sciences (SPSS) Version 15 was used for data analysis. Pearson chi-square test was performed to test the difference between categorical data. Fisher's exact test was used when expected cell values were  $<5$ . The normality of all variables was tested using the normal curve and Kolmogorov–Smirnov test. Independent Student's  $t$ -test was employed for normally distributed variables (hemoglobin, height) to compare the mean level of parameters between boys and girls, presenting standard deviation to show the individual variability for the studied parameters. In case of non-normality, a non-parametric Mann–Whitney U-

test was used to compare mean level of continuous variables (weight, BMI, energy, macronutrients, and micronutrients) between different sexes. The Recommended Daily Allowances (RDAs) used were based on (National Research Council 1989) less than 80% of RDA considered as a marginal intake of nutrients. Kruskal–Wallis H-test was used to compare the mean energy and physical inactivity among different categories of anthropometric indices (underweight, normal, overweight, obese). For dietary components showing significant difference among the previous indices, Mann–Whitney U-test followed the previous test for multiple comparison of each pair of these indices.

### ***3.1.b Theme two: Unintentional Injuries***

Data from the cross-sectional 2006 HBSC survey was used. The total of 15,963 students (47.3% boys and 52.7% girls) from grades 6, 8, 10, and 12 were selected using a stratified, two stage cluster sampling. The students completed independently a modified version of the international WHO international HBSC questionnaire. In addition to the major variables addressed in the survey (demographics, general health, well-being, family and peer relationships, school environment, exercise and leisure-time activities, diet, smoking, exposure to political violence, and mental health), the questionnaire contained two additional optional packages: Form A contained optional questions on violence, injuries, and social inequalities, and the other half of the questionnaire (Form B) contained optional questions on physical activity, eating, labor, dieting, and mental and physical health. Equal numbers of Form A and Form B were randomly distributed in each school class. However, the injury filter items were asked to all sampled students. To fulfill the purpose of this study, Form B including 6458 students was included in the analysis. Data collection and entry was conducted by Al-Quds Nutrition and Health Research Institute (ANAHRI) in Al-Quds University. Data analysis was performed using the SPSS statistical package version 20. Percentages for injuries have been calculated on the basis of socio-demographic characteristics (grade, gender, region, school ownership, and FAS). Chi-square test was used to compare differences in injuries among adolescents

by socio-demographic characteristics. As well as to compare differences in work status, type of work and related injuries among adolescents by several socio-demographic characteristics. Univariate and multivariate logistic regression models were used to assess the association between work injury and work intensity, work shift, type of work and socio-demographic characteristics. Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) were derived. A significance level of  $P < 0.05$  was used.

# CHAPTER 4

## 4.1 Results

### *4.1.a Theme one: Nutrition and Obesity*

The study showed that adults were more obese than children in all Mediterranean continents and in different levels of income. The prevalence of obesity among European children was higher than among Asians. Also, European adults were more obese than European children. The total female adults were found to be more obese (median: 25.3%) than male adults (median: 20.0%). The regression model analysis indicated that male adults were more likely to be obese in the Euro-Med region. Taking different factors into consideration, it was noticed that Mediterranean adults, especially those in the European region, are at higher risk of obesity.

Furthermore, the study revealed that being overweight (24.3%) or obese (9.9%) coexisted with being underweight (4.8%) and/or anemic (23.3%) among Palestinian children in Jerusalem. Only 22.4% of the students had physical activity for 5 days a week with boys being more physically active than girls ( $p < 0.01$ ). Inadequate energy intake had 55.66% of boys and 64.81% of girls; inadequate protein intake was reported by 15.07% of boys and 43.08% of girls. The majority of them met  $< 80\%$  of the recommended daily allowances for most micronutrients. The whole sample and especially boys consumed more total, saturated fat, less monounsaturated fat and carbohydrates than what is advised. Obese and overweight adolescents had lower energy intake ( $p < 0.05$ ) and a lower trend in being physically active than normal weight counterparts.



#### ***4.2.b Theme two: Unintentional Injuries***

The number of school children participating in the HBSC 2006 survey was 15,963. From which 47.6% were injured, with boys (53.5%) being statistically higher than girls (42.1%) ( $P < 0.001$ ). The prevalence of those injured more than once decreased by age and was also found significantly higher in boys than in girls (27.3% and 17.9%, resp.) ( $P < 0.001$ ). Children living in low FAS families showed significantly lower ratios of injuries than those living in moderate and high FAS families ( $P < 0.001$ ). Injuries while biking were significantly higher among boys (46.3%) than girls (41.7%) ( $P < 0.001$ ), and injuries while walking/running were more prevalent among girls (32.5%) than boys (28.0%) ( $P < 0.001$ ).

From the total selected children, 6458 (40.8%) completed an optional package related to labor. Approximately 73.8% of the students who filled the optional package reported working during the last 12 months, from whom 79.1% sustained a work related injury. Work injuries were significantly higher among boys, younger children, children enrolled in UNRWA Schools and living in Gaza Strip ( $P < 0.05$ ). Children working  $\geq 3$  hours/day were more likely to experience injuries 1.73 (95% CI, 1.53-1.95) than those working  $\leq 3$ /day. About half of the children worked in retail trade (51.5%), agriculture (20.0%) and cleaning (11.4%). Injury type was related to the type of work performed.

## CHAPTER 4.1

### Obesity in Mediterranean region (1997–2007)

#### A systematic review

C. Papandreou<sup>1</sup>, T. Abu Mourad, C. Jildeh, Z. Abdeen, A. Philalithis  
and N. Tzanakis,

Obesity Reviews (2008) 9, 389–399

## National Prevalence of Obesity

# Obesity in Mediterranean region (1997–2007): a systematic review

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## Summary

The objective of this review is to determine the distribution of obesity by geographical location, income, age and sex in the Mediterranean region during the last decade. A meta-analysis was conducted for 102 articles cited during the period (1997–2007) in Medline database (for 17 Mediterranean countries) searched during the summer of 2007 using the word ‘obesity’ and its related keywords. The study showed that adults were more obese than children in all Mediterranean continents and in different levels of income. The prevalence of obesity among European children was higher than among Asians. Also, European adults were more obese than European children. The total female adults were found to be more obese (median: 25.3%) than male adults (median: 20.0%). The regression model analysis indicated that male adults were more likely to be obese in the Euro-Med region. Taking different factors into consideration, it was noticed that Mediterranean adults, especially those in the European region, are at higher risk of obesity. Awareness programmes addressing the importance of adopting healthy dietary habits combined with physical activity should target the whole community in general and adults in particular. The findings could guide health planners for better management of obesity.

**Keywords:** Age, economic level, geographic location, obesity, sex.

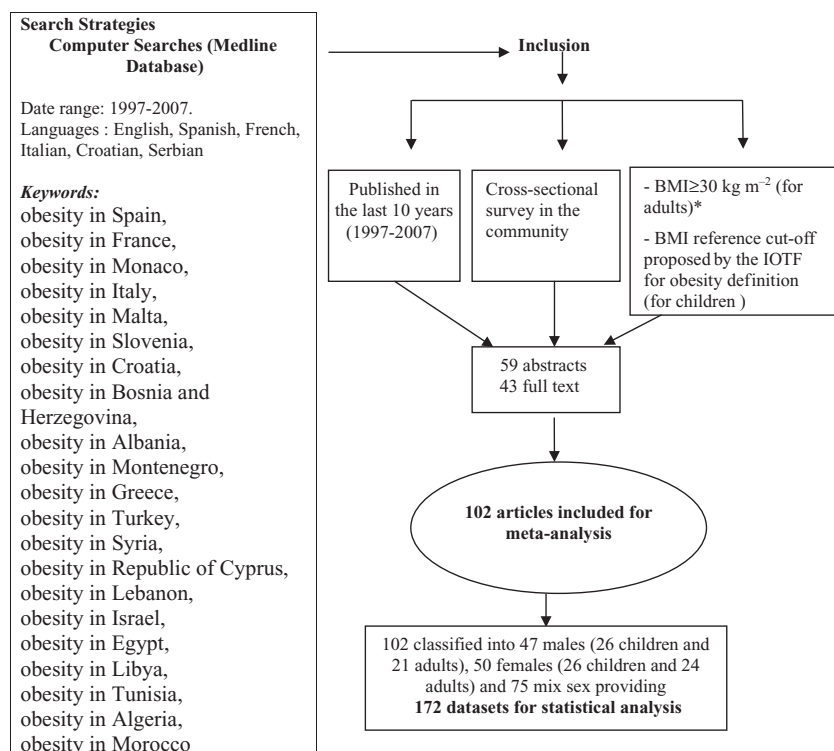
**obesity reviews** (2008)

## Introduction

The Mediterranean region constitutes an area formed by sea and land that covers about 2.5 million km<sup>2</sup>. This area includes three continents (Europe, Africa, Asia), which in turn contain several countries that possess a seashore of the Mediterranean Sea (1). According to the level of economic development, Mediterranean countries vary from low- to high-income countries (2–9). Other differences existing among these countries are racial and cultural ones (religion, language, habits . . . ) (10). Although continents around the world embody many differences, they still have a few things in common. Over the last decade, the prevalence of obesity has risen in both developed and developing countries affecting both children and adults (11–13). Obesity, which is an abnormal or excessive fat accumulation to the extent that

health is impaired (14), has been found to be associated with various diseases such as hypertension (15), myocardial infarction (16), stroke (17), diabetes mellitus (18), different types of cancer (19) and sleep apnoea syndrome (20). It is clear that obesity does not discriminate between geographical location, economic level, sex and age.

To the best of our knowledge, no previous studies have focused on the obesity problem among the Mediterranean region as a whole and its continents in part. This review aims to point out the prevalence and distribution of obesity in the Mediterranean region over the last decade divided by geographical location, income, age and sex. In addition, it attempts to answer the following research question: what are the factors (geographical, economic, sex and age) that either separately or jointly act as best predictors of the variation of obesity prevalence in the Mediterranean region?



**Figure 1** Flow diagram of study selection.  
\*BMI = weight (kg) divided by the square of the height ( $\text{m}^2$ ) as measured anthropometrically. BMI, body mass index; IOTF, International Obesity Task Force.

## Methods

A meta-analysis type of study was conducted. It is a quantitative systematic review that combines the results of previous research studies that examine obesity. Its aim is to produce and investigate an estimate of obesity burden in the Mediterranean region (21).

## Data source

The data were collected from only Medline database during the summer of 2007. The keywords and selection criteria are summarized in Fig. 1. A total of 102 studies met these criteria (listed in Appendix 1). As there were no available data for Monaco, Malta, Libya and Algeria, 17 of 21 countries were included in this study. The datasets used for statistical analysis reached 172 because some articles were used for more than one dataset.

## Quality of the data collection

The first author using the University of Crete Medical School library searched Medline search engine for all abstracts and full text articles that met the selection criteria. In parallel and independently, the second author followed the same suite for data collection. Upon the consensus of all authors, 102 publications were used as the bases for this meta-analysis study ( $n = 102$ ) (Table 1).

## Study variables and data management

### Obesity (dependent variable)

While body mass index ( $\text{weight/height}^2$ ) with a cut-off value of  $\geq 30$  was used to measure obesity among those being  $>18$  years old, the International Obesity Task Force criteria for obesity definition of subjects aged  $\leq 18$  years were taken into consideration (22,23) (see Fig. 1).

### Studied countries

Twenty-one countries located in the Mediterranean basin were chosen. A list of these countries stratified by the continents is illustrated in Table 1.

### Age

The obesity studies included individuals from all ages; they were neither unified nor standardized, which made it difficult during the analysis. In order to overcome this misclassification, only two age groups were used to categorize the studied subjects: children aged  $\leq 18$  years and adults aged  $>18$  years.

### Sex

Of the 172 datasets used in this study, 47 datasets studied obesity among males and 50 datasets studied obesity

**Table 1** Articles appeared on the Medline during searching the word 'obesity' limited to Mediterranean countries during 1997–2007

Author	Date of surveys	Number of articles	Mediterranean countries	Continent
Pérez-Rodrigo <i>et al.</i> , 2006 (40); Villarino Rodríguez <i>et al.</i> , 2002 (41); Andreyeva <i>et al.</i> , 2007 (38); Schröder <i>et al.</i> , 2007 (39); Martínez Vizcaino <i>et al.</i> , 2006 (42); Garcés <i>et al.</i> , 2005 (43); Gutiérrez-Fisac <i>et al.</i> , 2004 (45); Aranceta Bartrina, 2002 (46); Martínez-Ros <i>et al.</i> , 2001 (47); Divisón <i>et al.</i> , 1998 (48); Varo <i>et al.</i> , 2002 (36); Guallar-Castillón <i>et al.</i> , 2007 (37); Moreno <i>et al.</i> , 2005 (44)	1997–2004	14	Spain	Europe
Emery <i>et al.</i> , 2007 (50); Benigni <i>et al.</i> , 2006 (51); Bocquier <i>et al.</i> , 2006 (52); Paraponaris <i>et al.</i> , 2005 (53); Romon <i>et al.</i> , 2005 (54); Heude <i>et al.</i> , 2003 (55); Varo <i>et al.</i> , 2002 (36); Vigié <i>et al.</i> , 2002 (56); Klein-Platat <i>et al.</i> , 2003 (57); Rolland-Cachera <i>et al.</i> , 2002 (58); Marques-Vidal <i>et al.</i> , 2002 (59); Ginioux <i>et al.</i> , 2006 (60)	1997–2004	12	France	Europe
De Vito <i>et al.</i> , 1999 (63); Varo <i>et al.</i> , 2002 (36); Velluzzi <i>et al.</i> , 2007 (61); Sanna <i>et al.</i> , 2006 (62); Bertino <i>et al.</i> , 2006 (64); Martinelli <i>et al.</i> , 2006 (65); Maffei <i>et al.</i> , 2006 (66); Vidal <i>et al.</i> , 2006 (67); Baratta <i>et al.</i> , 2006 (68); Gallus <i>et al.</i> , 2006 (69); Manzoli <i>et al.</i> , 2005 (70); Turconi <i>et al.</i> , 2006 (71); Vieno <i>et al.</i> , 2005 (49); Tognarelli <i>et al.</i> , 2004 (72); Celi <i>et al.</i> , 2003 (77); Romiti <i>et al.</i> , 2000 (73); Boldori and Marelli, 2000 (74); Petti <i>et al.</i> , 1997 (75); Inelmen <i>et al.</i> , 2000 (76)	1997–2006	19	Italy	Europe
Zaletel-Kragelj <i>et al.</i> , 2004 (78)	2001–2002	1	Slovenia	Europe
Heim <i>et al.</i> , 2007 (79); Zajc <i>et al.</i> , 2006 (80)	2001–2005	2	Croatia	Europe
Jusupović <i>et al.</i> , 2004 (82); Jusupović <i>et al.</i> , 2005 (81)	2004–2005	2	Bosnia and Herzegovina	Europe
Shapo <i>et al.</i> , 2003 (83)	2001	1	Albania	Europe
Grujić <i>et al.</i> , 2005 (132)	2005	1	Montenegro	Europe
Tokmakidis <i>et al.</i> , 2007 (85); Papadimitriou <i>et al.</i> , 2006 (84); Kapantais <i>et al.</i> , 2006 (86); Tokmakidis <i>et al.</i> , 2006 (87); Angelopoulos <i>et al.</i> , 2006 (88); Panagiotakos <i>et al.</i> , 2006 (89); Krassas <i>et al.</i> , 2004 (90); Manios <i>et al.</i> , 2005 (91); Karayiannis <i>et al.</i> , 2003 (92)	2001–2006	9	Greece	Europe
Turkay <i>et al.</i> , 2007 (93); Ozmen <i>et al.</i> , 2007 (94); Ozer, 2007 (95); Dinç <i>et al.</i> , 2006 (96); Turkkahraman <i>et al.</i> , 2006 (97); Bundak <i>et al.</i> , 2006 (98); Krassas <i>et al.</i> , 2004 (90); Yumuk <i>et al.</i> , 2005 (99); Sansoy, 2003 (100); Oner <i>et al.</i> , 2004 (101); Erem <i>et al.</i> , 2004 (102); Kanbur <i>et al.</i> , 2002 (103); Erem <i>et al.</i> , 2001 (104); Sur <i>et al.</i> , 2005 (105); Duyar and Ozener <i>et al.</i> , 2005 (106)	1998–2006	15	Turkey	Asia
Maziak <i>et al.</i> , 2007 (107)	2004	1	Syria	Asia
Savva <i>et al.</i> , 2005 (108); Savva <i>et al.</i> , 2002 (109)	1999–2004	2	Republic of Cyprus	Asia
Chakar and Salameh, 2006 (110); Jabre <i>et al.</i> , 2005 (111)	2000–2003	2	Lebanon	Asia
Israeli <i>et al.</i> , 2006 (112); Keinan-Boker <i>et al.</i> , 2005 (113); Kaluski and Berry, 2005 (114); Bar Dayan <i>et al.</i> , 2005 (115)	1999–2003	4	Israel	Asia
Asfaw, 2007 (116); Bakr <i>et al.</i> , 2002 (117); Kharboush <i>et al.</i> , 2005 (118); Salazar-Martinez <i>et al.</i> , 2006 (119); Jackson <i>et al.</i> , 2003 (120)	1997–2007	5	Egypt	Africa
Ben Salem <i>et al.</i> , 2006 (122); Blouza-Chabchoub <i>et al.</i> , 2006 (123); Laouani Kechrid <i>et al.</i> , 2004 (124); Ghannem <i>et al.</i> , 2001a (125); Ben Slama <i>et al.</i> , 2002 (126); Gaha <i>et al.</i> , 2002 (127); Ghannem <i>et al.</i> , 2001b (128); Ben Mami Ben Miled <i>et al.</i> , 2000 (129); Mokhtar <i>et al.</i> , 2001 (121)	1997–2006	9	Tunisia	Africa
Rguibi and Belahsen, 2007 (130); Rguibi and Belahsen, 2004 (131); Mokhtar <i>et al.</i> , 2001 (121)	1998–2002	3	Morocco	Africa
Total		102	17	3

among females. The rest of the 75 datasets did not distinguish between sexes.

### Gross national income (GNI, formerly gross national product or GNP)

The broadest measure of national income measures the total value added from domestic and foreign sources claimed by residents. GNI comprises gross domestic product plus net receipts of primary income from foreign sources. GNI per capita is GNI divided by midyear population. Based on the GNI per capita, the World Bank classifies countries into four categories (low income, low middle-income, upper middle-income and high income) (8). To increase the statistical power, the low middle-income category was added to the upper middle-income category.

### Statistical analysis

SPSS version 15 (24) was used for data analysis. The obesity publications were distributed according to the date of surveys, number of articles and type of continents; in addition, they were cross-tabulated. When using the normal curve and Kolmogorov–Smirnov test, the obesity prevalence was not normally distributed, therefore, the obesity prevalence described based on sex, age groups, economic level and continent was presented. It was presented in median, the first and the third quartiles. A non-parametric Mann–Whitney *U*-test was used to compare the obesity prevalence between two groups (sex, age and income). As few obesity-related studies were performed in Africa, and because of the small number of cases in the age and sex categories, the Mann–Whitney *U*-test was not performed on this continent (Table 2). The one-sample *t*-test was used to compare the mean prevalence of obesity in the Mediterranean part of Europe with the expected prevalence in Europe as a whole.

Because the obesity data were not normally distributed, obesity was log-transformed to become normal. Then Pearson product moment correlation coefficients were used to test the binary association between obesity prevalence (log-transformation data) and the associated independent variables such as age, sex and GNI. Multicollinearity was evaluated using two methods: factor inflation variance and binary correlation of the independent variables. It was assumed that there is an interaction effect between age and sex, age and GNI, sex and GNI. When included in the equation as a multiplicative term, no statistically significant effect was revealed and accordingly the term was excluded from the final analysis. The associated variables with the log-transformed obesity data ( $P < 0.1$ ) were subsequently used in the regression model. The latter model was conducted for each continent – Europe, Asia and Africa – separately. The stepwise with pairwise method exclusion

was used. In addition, the standardized b-coefficient as well as *t*-value was presented and the adjusted  $R^2$  was used to test the explained variance (25–27).

## Results

The prevalence of obesity stratified by continent, economic level, sex and age is summarized in Table 2.

### Distribution of obesity in Europe by sex and age

The study showed that the prevalence of obesity was higher among male adults than among children; this difference did not reach the significant level ( $P = 0.09$ ). In contrast, the female results showed a significant difference between children (median: 7.50%) and adults (median: 23.70%) ( $P < 0.01$ ) with the prevalence of obesity being threefold higher in adults. Although the prevalence of obesity was higher among male (median: 11.50%) than among female children (median: 7.50%), there was no statistical difference. In addition, the prevalence of obesity in male adults (median: 20.00%) was insignificantly lower than in female adults (median: 23.70%).

### Distribution of obesity in Asia by sex and age

In Asia, male adults (median: 25.60%) had significantly higher percentage of obesity than male children (median: 4.85%) ( $P < 0.01$ ). The prevalence of obesity was 10-fold higher among female adults (median: 34.90%) than among female children (median: 3.20%) ( $P < 0.01$ ). This study indicated that the median obesity among male children (4.85%) was slightly higher than among female children (3.20%). However, female adults (median: 34.90%) were more obese than male adults (median: 25.60%). The difference in both cases was not statistically significant.

### Comparison of obesity among continents

As illustrated in Table 2, the prevalence of obesity among both European male (median: 11.50%) and female children (median: 7.50%) was higher than among Asian male (median: 4.85%) ( $P < 0.05$ ) and female children (median: 3.20%) ( $P < 0.05$ ).

### Obesity and level of income

In high and middle levels of income, adults were found to be more obese than children. There was no statistical difference when comparing male children in different levels of income; in addition, female children showed similar trend. The same results applied for adults in both sexes (Table 2).

**Table 2** Prevalence of obesity by sex, age groups, economic level and the type of continent

Parameters	Sex	Age group	Obesity (%) First quartile	Median	Third quartile	P-value*
Continent						
Europe ( <i>n</i> = 58) <sup>†</sup>	Male ( <i>n</i> = 29)	Children ( <i>n</i> = 15) <sup>1</sup>	6.30	11.50	21.20	0.09
		Adults ( <i>n</i> = 14) <sup>2</sup>	11.50	20.00	23.20	
	Female ( <i>n</i> = 29)	Children ( <i>n</i> = 15) <sup>3</sup>	4.40	7.50	11.90	<0.01
		Adults ( <i>n</i> = 14) <sup>4</sup>	15.00	23.70	30.90	
Asia ( <i>n</i> = 27)	Male ( <i>n</i> = 13)	Children ( <i>n</i> = 8) <sup>5</sup>	3.93	4.85	6.98	<0.01
		Adults ( <i>n</i> = 5) <sup>6</sup>	17.98	25.60	31.50	
	Female ( <i>n</i> = 14)	Children ( <i>n</i> = 9) <sup>7</sup>	1.85	3.20	4.95	<0.01
		Adults ( <i>n</i> = 5) <sup>8</sup>	17.93	34.90	44.90	
Economic level						
High income ( <i>n</i> = 44)	Male ( <i>n</i> = 21)	Children ( <i>n</i> = 13) <sup>9</sup>	5.20	11.50	18.60	0.064
		Adults ( <i>n</i> = 8) <sup>10</sup>	12.95	20.10	26.48	
	Female ( <i>n</i> = 23)	Children ( <i>n</i> = 13) <sup>11</sup>	3.85	7.20	10.20	<0.01
		Adults ( <i>n</i> = 10) <sup>12</sup>	15.15	24.35	40.50	
Middle income ( <i>n</i> = 29)	Male ( <i>n</i> = 14)	Children ( <i>n</i> = 9) <sup>13</sup>	2.30	3.90	8.55	0.03
		Adults ( <i>n</i> = 5) <sup>14</sup>	12.25	22.00	30.60	
	Female ( <i>n</i> = 15)	Children ( <i>n</i> = 9) <sup>15</sup>	1.90	3.20	5.10	<0.01
		Adults ( <i>n</i> = 6) <sup>16</sup>	20.02	30.15	49.80	
Total by sex and age ( <i>n</i> = 97)	Male ( <i>n</i> = 47)	Children ( <i>n</i> = 26) <sup>17</sup>	3.85	6.95	11.93	<0.0001
		Adults ( <i>n</i> = 21) <sup>18</sup>	10.65	20.00	24.60	
	Female ( <i>n</i> = 50)	Children ( <i>n</i> = 26) <sup>19</sup>	2.55	5.00	8.25	<0.0001
		Adults ( <i>n</i> = 24) <sup>20</sup>	15.95	25.30	37.26	

\**P*-value of non-parametric Mann–Whitney *U*-test (children vs. adults).

<sup>†</sup>The one-sample *t*-test for comparing obesity in Europe as it is expected by 2010 (32) among children for the last decade (10%) was not significantly different from the mean obesity of this study (10.2%) focusing in the Mediterranean Europe (*P* = 0.83). The one-sample *t*-test for comparing obesity in Europe as it is expected by 2010 (32) among adults for the last decade (20%) was not significantly different from the mean obesity of this study (18.6%) focusing in the Mediterranean Europe (*P* = 0.28).

Children: ≤18 years old.

Adult: >18 years old.

By using Mann–Whitney *U*-test, the following comparisons were performed:

1 vs. 3 = European male children vs. European female children (*P* = 0.16).

2 vs. 4 = European male adults vs. European female adults (*P* = 0.30).

5 vs. 7 = Asian male children vs. Asian female children (*P* = 0.09).

6 vs. 8 = Asian male adults vs. Asian female adults (*P* = 0.39).

1 vs. 5 = European male children vs. Asian males children (*P* = 0.016).

2 vs. 6 = European male adults vs. Asian males adults (*P* = 0.152).

3 vs. 7 = European female children vs. Asian females children (*P* = 0.012).

4 vs. 8 = European female adults vs. Asian female adults (*P* = 0.262).

9 vs. 13 = High-income male children vs. middle-income male children (*P* = 0.071).

10 vs. 14 = High-income male adults vs. middle-income male adults (*P* = 0.62).

11 vs. 15 = High-income female children vs. middle-income female children (*P* = 0.074).

12 vs. 16 = High-income female adults vs. middle-income female adults (*P* = 0.368).

17 vs. 19 = Total male children vs. total female children (*P* = 0.122).

18 vs. 20 = Total male adults vs. total female adults (*P* = 0.030).

## Distribution of obesity among the study sample by age and sex

Among male adults, the percentage of obesity was higher (median: 20.00%) than among male children (median: 6.95%) (*P* < 0.0001). Similar result was also found between female adults (median: 25.30%) and female children (median: 5.00%). When comparing total male with total female children, there was no significant difference.

On the other hand, female adults (median: 25.30%) were found to be more obese than male adults (median: 20.00%) (*P* < 0.05).

## Predicted prevalence of obesity

Literature review has shown that only Europe had studies showing the expected prevalence of obesity by the end of the first decade. When matching the mean prevalence of

**Table 3** Pearson product moment correlation coefficients and level of significance for each continent

Significance <sup>1</sup>	Age	Sex	GNI	Log-obesity
Correlation <sup>2</sup>				
All continents				
Age	1	0.303	0.002	<b>0.0001</b>
Sex	−0.078	1	0.223	0.696
GNI	−0.272	0.110	1	0.352
Log-obesity	0.391	−0.029	0.084	1
Europe				
Age	1	0.486	0.036	<b>0.0001</b>
Sex	−0.069	1	0.663	<b>0.021</b>
GNI	−0.242	0.051	1	0.486
Log-obesity	0.494	−0.225	−0.081	1
Asia				
Age	1	0.781	0.100	<b>0.013</b>
Sex	−0.044	1	0.503	0.426
GNI	−0.287	0.119	1	0.699
Log-obesity	0.374	0.125	−0.069	1
Africa				
Age	1	0.349	0.010	<b>0.034</b>
Sex	−0.177	1	0.998	0.269
GNI	−0.659	0.001	1	<b>0.060</b>
Log-obesity	0.389	0.209	−0.514	1

GNI, gross national income (percentage per capita); bolds indicate the variables of  $p < 0.1$ .

1. Significance ( $p$  value): the numbers above the diagonal.

2. Correlation ( $r$ ): the numbers below the diagonal.

obesity among children (10.2%), during the period 1997–2007, with the expected figure (10.0%) for the year of 2010, there was no statistical difference between the observed and the expected. Similar results were found among adults.

### Obesity and associated potential factors

The correlation among independent variables was not strong, which showed no effect of multicollinearity. Tolerance was closed to 1 while factor inflation variance was around 1, which indicates the absence of multicollinearity among independent variables. Table 3 presents a binary correlation between obesity (log-obesity) and age, sex, GNI and continents. For all continents, the age was the only variable positively associated with log-obesity ( $P < 0.001$ ). In Europe, the binary correlation of obesity with age showed strong positive association, which persisted after adjusting for sex. In addition, sex was associated with log-obesity. This association did not change when adjusted for age. In Asia, the only variable positively associated with log-obesity was age. In Africa, age and GNI were associated with log-obesity but the association was not significant when they were adjusted in the regression model (see Table 4).

**Table 4** Regression analysis of obesity in relation to significant associated parameters

	Standardized b-coefficients	t-value	Significance
Europe*			
Age	0.481	5.716	0.0001
Sex	−0.192	−2.283	0.025
Africa†			
Age	0.088	0.258	0.801
GNI	−0.456	−1.329	0.211

\*Adjusted  $R^2 = 0.267$ .

†Adjusted  $R^2 = 0.136$ .

GNI, gross national income.

### Discussion

This study was carried out using a meta-analysis approach to figure out the prevalence of obesity in the last decade through pooling the data and subsequently stratifying them to different subcategories of interest. Preliminary findings showed that most of the adults were significantly more obese than children for both sexes, continents (Europe, Asia) and different levels of income. This could be explained by the fact that children have different dietary pattern, physical activity, lifestyle and are more likely to be active, which results in spending more energy while adults may be eating more than their energy demands. A possible explanation for not reaching the significant level in European males for the prevalence of obesity between adults and children is that physical activity among the youngest age category is declining rapidly (28). The same pattern could explain the findings that show that European children are more obese than their Asian counterparts. According to our knowledge, European children spend much of their time in non-energetic activities, like playing videogames and using Internet, which decrease their physical movement and energy expenditure.

Based on levels of income, there was no significant difference in the prevalence of obesity among people, which could be explained by the fact that in less rich countries (middle-income), people consume energy-dense foods, like processed, rich-in-fat and simple carbohydrate (foods associated with a 'Western' diet), because of the lower price of such kind of food (29). Similarly, in rich countries, people are used to eating energy-rich food such as 'fast food' because of the predominant lifestyle (30). Also, it is important to mention that the selected countries in this study did not belong to the low-income category that could justify the consumption of a variety of food that might be either healthy or not. Among Mediterranean European females, the percentage of adulthood obesity appeared to be higher than that of childhood obesity, which is in agreement with the general phenomenon within such community (31). In



Mediterranean Asia, obesity was more prevalent among adults than among children independent of sex. The Asian Mediterranean countries that were investigated in this study seem to be close to the European part of Mediterranean region. This may result in similarity in the trend of obesity based on age distribution and this needs further investigation.

It is worth to say that there are many differences between women and men in the quality and quantity of food consumption. As many efforts and several programmes target women's health, this contributed in improving awareness among women. This awareness probably reached the level that creates a change in their behaviour, explaining why the prevalence of obesity was higher among male adults than among female adults, when adjusted for other factors (32). Based on our knowledge regarding European culture, European women are influenced by mass media, which encourage females to keep fit in order to be more socially accepted. This may support our results, which showed that European women after adjustment seem to be less obese.

Obesity by 2010 is expected to be 10% and 20% among European children and adults, respectively. In the current study, the mean prevalence of obesity in Euro-Med adults and children was not significantly different from the expected value (33). This means that Euro-Med countries faced the burden of obesity prior to the expected year.

### Strengths and limitations

This study covered 17 countries located in three continents around the Mediterranean Sea; the data were collected from 172 cases, which is statistically enough to draw conclusions about the prevalence of obesity in this region. It was quite difficult to make the comparison of obesity across several age groups because of the fact that these studies used different population age structures (34). In order to overcome this problem, age was stratified into two main groups:  $\leq 18$  years and  $> 18$  years. To ensure statistical accuracy, small frequencies were excluded. The study was based on Medline interface (PubMed), an online bibliographic database that includes more than 10 million references, abstracts of peer-reviewed journals (35) and a wide range of databases, such as Cochrane.

To ensure validity and reliability of the results and to avoid the probability of systematic bias, local reports were excluded. As the scope of the study was to assess the prevalence of obesity in the Mediterranean continents, the continents were used as the unit of analysis rather than countries and therefore, repetition of previous studies was avoided.

### Conclusion

Adults belonging to the Mediterranean basin are at high risk of obesity regardless of the geographical location or income. As Euro-Med male adults had the highest obesity levels, awareness programmes addressing the importance of adopting healthy dietary habits combined with an increase of physical activity should target the community in general and adults in particular. Finally, the results of this study would contribute to guiding health planners and administrators to develop proper tools for obesity management.

### Conflict of Interest Statement

No conflict of interest was declared.

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## Appendix 1

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## CHAPTER 4.2

### **Assessing the nutritional status of Palestinian adolescents from East Jerusalem: a School-based Study 2002/2003**

#### **A cross-sectional study**

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# Assessing the Nutritional Status of Palestinian Adolescents from East Jerusalem: a School-based Study 2002–03

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## Summary

In Palestine, there is a little information about nutrition of adolescents compared to other age groups. This study was designed to assess the nutritional status of Palestinian school-aged children (11–16 years) in East Jerusalem during 2002–03. A school-based cross-sectional study targeted randomly 313 adolescents from public and private schools. A previously validated and reliable questionnaire was administered through interviews that included anthropometric and hemoglobin measurements, 24-h dietary intake recall and physical activity questionnaire. It was found that being overweight (24.3%) or obese (9.9%) coexisted with being underweight (4.8%) and/or anemic (23.3%). Only 22.4% of the study subject had physical activity for  $\geq 5$  days a week with boys being more physically active than girls ( $p < 0.01$ ). Inadequate energy intake had 55.66% of boys and 64.81% of girls; inadequate protein intake was reported by 15.07% of boys and 43.08% of girls. The majority of them met  $< 80\%$  of the recommended daily allowances for most micronutrients. The whole sample and especially boys consumed more total, saturated fat, less monounsaturated fat and carbohydrates than what is advised. Obese and overweight adolescents had lower energy intake ( $p < 0.05$ ) and a lower trend in being physically active than normal weight counterparts. School health education programs targeted at adolescents and parents need to be developed as part of overweight-obesity, malnutrition and anemia prevention.

**Key words:** adolescents, nutritional status, anemia, dietary intake, East Jerusalem.

## Introduction

Assessing the nutritional status of children is a widely used method to monitor and evaluate their health. Satisfactory dietary intake and consequently good nutritional status is important for the physical and

mental development during the paediatric years. Children gain up to 50% of their adult weight,  $> 20\%$  of their height and 50% of their adult skeletal mass and especially adolescents who reach their final height [1] and being malnourished in this age exposes them to serious health problems on the short and long term [2, 3].

Evidence from many studies from developing countries have shown that adolescents received little attention regarding their nutrition [4] and suggests that intakes of several essential dietary nutrients do not meet the recommendations, whereas intakes from fat exceeds the recommendations [5].

In Palestine, dietary habits and nutritional status of pre-school children, non-pregnant women (aged 15–49 years) and adults (aged 18–64 years) have

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been studied extensively, while little attention has been paid to adolescents [3, 6, 7], who represent 32% of the total population [8]. However, at the time of our study, no data about the nutrition intake and physical activity among school adolescents was available. Consequently, the purpose of the present study was to assess the nutritional status of Jerusalemite school children during puberty by applying anthropometric measurements, biochemical test, dietary intake estimation and lifestyle assessment. The study was part of a broader initiative of the World Health Organization (WHO) to explore the health and nutrition status of children and adolescents in more than 35 countries including Palestine.

## Methods

### Settings

This cross-sectional study is part of The Health Behavior for School-Aged Children Project (HBSC) targeting school aged children in East Jerusalem during 2002–03. The four school ownerships [Palestinian schools, United Nations Relief and Works Agency (UNRWA) schools, Israeli Municipality schools and Private schools] were eligible. However, the authorities of the Israeli Municipality refused our request to blood samples from school participants and they allowed us to administer the questionnaire outside school hours, this proved to be a difficult exercise because students were in a rush to go home. Furthermore, the idea of administering the questionnaire at their respective homes was not easily attainable due to lack of information about their addresses. Nonetheless, we managed to administer ~15% of the total number. The authors took the decision to exclude them from the total sample due to the low number.

Due to lack of financial means, a cross-sectional study rather than case-control study design was pursued.

### Sampling

Based on the WHO 1997/1998 research protocol, three age groups of school aged children were selected with a year interval; these age groups were considered as adolescents based on the WHO criteria [9]. The selection of study population was multi-staged stratified and designed according to school ownerships, classes (6th, 8th, 10th grade) and gender. 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. Considering that the Israeli Municipality schools were excluded, a total of 313 students 11–16 years old were finally studied (159 males and 154 females). All the invited students participated in this study, giving a response rate of 100%.

### Measurement tools

**Questionnaire.** The questionnaire used in the study was developed during the First Palestinian National Health and Nutrition Survey in 2000 [10]. It included several dimensions such as socio-demographic, anthropometric, nutritional 24-h recall and life style.

### Outcome measurements

**Anthropometric measurements.** Weight was measured without shoes in light clothes using TANITA digital scale (model 1582) to the measurement 0.1 kg while height in standing position to the nearest 0.1 cm using a coil-spring tape measure. An experience field worker carried out these measurements in the school before the interview.

The anthropometric categorization of children was made according to Centers for Disease Control (CDC) and International Obesity Taskforce (IOTF) [11, 12]. For analytic reasons, children were divided into four groups: underweight, normal, overweight and obese.

**Hematological screening test.** Blood samples for hemoglobin level assessment were collected using an instantly calibrated finger prick Hemocue machine (Hemocue AB, Angelholm, Sweden). Anemia was defined as hemoglobin value below  $12 \text{ g dl}^{-1}$  for girls and boys younger than 14 years and  $<13 \text{ g dl}^{-1}$  for boys older than 14 years [13].

**Dietary assessment.** A 24-h recall technique was applied to describe dietary intake of school children. A modified USDA food database to include the Palestinian typical dietary patterns [10] was used to assess the dietary intake.

An expert in this field was responsible for administering the 24-h recall according to protocol. There was little burden on the child, as each interview generally took about 20–45 min. Children were asked to describe the type and amount of food, as well as all beverages consumed during the day preceding the interview. To improve the accuracy of food descriptions, a food intake booklet, including pictures of



Palestinian food, was used to define amounts when appropriate.

**Physical activity assessment.** The students' responses to physical activity questionnaires were categorized based on a recently published study [7].

#### Data analysis

The Statistical Package for Social Sciences (SPSS) Version 15 was used for data analysis.

Pearson chi-square test was performed to test the difference between categorical data. Fisher's exact test was used when expected cell values were  $<5$ . We tested the normality of all variables by using the normal curve and Kolmogorov–Smirnov test. Independent Student's *t*-test was employed for normally distributed variables (hemoglobin, height) to compare the mean level of parameters between boys and girls, presenting standard deviation to show the individual variability for the studied parameters. In case of non normality we used a non parametric Mann–Whitney U-test to compare mean level of continuous variables (weight, BMI, energy, macronutrients, and micronutrients) between different sexes. The Recommended Daily Allowances (RDAs) used were based on (National Research Council 1989) less than 80% of RDA considered as a marginal intake of nutrients [6, 14] Kruskal–Wallis H-test was used to compare the mean energy and physical inactivity among different categories of anthropometric indices (underweight, normal, overweight, obese). For dietary components showing significant difference among the previous indices, Mann–Whitney U-test followed the previous test for multiple comparison of each pair of these indices.

#### Ethics

The study was approved by the Human Research Ethics Committee at Al-Quds University. Approvals to carry out this study were granted by three school ownerships as well as the students' parents. Prior to the interview, children were asked verbally if they agreed to go on with the interview and the hemoglobin test. All respondents were guaranteed anonymity.

### Results

The socio-demographic, lifestyle and anthropometric characteristics of the study participants are presented in Table 1. In total, 314 children were recruited ranging from 11 to 16 years of age. The gender was almost equally distributed among the different age groups.

Overweight was prevalent in 24.3% of all children and 9.9% of the subjects was obese while 4.8% was underweight. No significant differences regarding

these anthropometric characteristics were observed between the two sexes.

A total of 252 (80.5%) subjects rated their health as an excellent, with boys reporting themselves as healthier ( $p < 0.01$ ).

The mean hemoglobin level ( $\text{g dL}^{-1}$ ) among the 313 children was  $13.11 \pm 1.36$  and anemia prevalence was 23.30%. Although the mean hemoglobin level was significantly higher in boys ( $13.35 \pm 1.40$ ) than in girls ( $12.87 \pm 1.28$ ) ( $p < 0.01$ ), anemia prevalence was not found to differentiate significantly between them. On the other hand, the prevalence of anemia was higher in underweight (26.7%) compared to normal-weight children (22.5%).

Out of the total interviewed students, 22.4% reported to have physical activity for  $>5$  days a week, with boys being more active ( $p < 0.01$ ), whereas girls reported to work longer with their homework ( $p < 0.01$ ).

Table 2 illustrates the energy and macronutrient intake (expressed as percentage of daily energy intakes) of all participants and according to gender. The reported energy intake from males was higher than females ( $p = 0.001$ ). When dietary intakes of the whole sample were compared with current recommendations (WHO 2002), it was observed that total and saturated fat were higher than recommended ( $<30$  and  $<10\%$  respectively), contrary to carbohydrates and monounsaturated fat that were lower ( $>55$  and  $15\text{--}20\%$ ). After categorizing children to males, their total and saturated fat intake was found to be considerably higher than recommended. On the other hand, in females the reported protein, monounsaturated fat, carbohydrate consumption were lower than recommended (protein intake should range between 12 and 20%). Finally, we checked for any gender differences in micronutrients intake and no statistical significance was indicated.

Table 3 depicts the number and percentage of schoolchildren in relation to age groups with inadequate ( $<80\%$  RDA) intakes of energy, protein and selected vitamins and minerals. More than half of boys (55.66%) and higher number of girls (64.81%) had inadequate energy intake. Nearly one-fifth of boys (15.07%) and half of girls (43.08%) showed inadequate protein intake. More than 50% of adolescent boys and girls were below 80% of the RDA for vitamins A, B6, B12, thiamin, riboflavin, niacin, iron (girls), calcium phosphorous, magnesium and zinc.

Table 4 shows the distribution of children in different anthropometric categories based on BMI cut-off values [11, 12]. It is observed that energy intake was significantly higher in the normal weight than the other categories ( $p < 0.05$ ). The distribution of physical inactivity according to each anthropometric category revealed that obese adolescents were considerably more physically inactive than their normal weight counterparts. In regards to either

TABLE 1  
General characteristics of school-aged children in East Jerusalem

Characteristics	Total (n = 313)	Male (n = 159)	Female (n = 154)	p-value
Age, years				
11–12, n (%)	117 (37.40)	60 (37.70)	57 (37.00)	0.976 <sup>a</sup>
13–14, n (%)	118 (37.70)	59 (37.10)	59 (38.30)	
15–16, n (%)	78 (24.90)	40 (25.20)	38 (24.70)	
Perceived health				
Healthy, n (%)	252 (80.50)	137 (86.20)	115 (74.70)	0.008 <sup>b</sup>
Un-healthy, n (%)	61 (19.50)	22 (13.80)	39 (25.30)	
BMI (kg m <sup>-2</sup> ), mean ± SD	21.18 ± 4.24	20.72 ± 3.98	21.65 ± 4.48	0.024 <sup>c</sup>
Underweight, <sup>d</sup> n (%)	15 (4.80)	6 (3.80)	9 (5.80)	0.390 <sup>a</sup>
Overweight, <sup>e</sup> n (%)	76 (24.3)	35 (22.00)	41 (26.6)	0.340 <sup>a</sup>
Obese, <sup>e</sup> n (%)	31 (9.9)	13 (8.20)	18 (11.70)	0.290 <sup>a</sup>
Hemoglobin (g dl <sup>-1</sup> ), mean ± SD	13.11 ± 1.36	13.35 ± 1.40	12.87 ± 1.28	0.001 <sup>f</sup>
Anemia <sup>g</sup>	73 (23.30)	32 (20.10)	41 (26.60)	0.110 <sup>b</sup>
Physical activity				
≥5 days a week, n (%)	70 (22.4)	46 (28.9)	24 (15.6)	0.003 <sup>b</sup>
<5 days a week, n (%)	243 (77.6)	113 (71.1)	130 (84.4)	
TV viewing				
≥4 h a day, n (%)	80 (25.60)	36 (22.60)	44 (28.60)	0.142 <sup>b</sup>
<4 h a day, n (%)	233 (74.40)	123 (77.40)	110 (71.40)	
Homework				
≥4 h a day, n (%)	35 (11.20)	7 (4.40)	28 (18.20)	0.001 <sup>b</sup>
<4 h a day, n (%)	278 (88.80)	152 (95.60)	126 (81.80)	
Using computer				
Yes, n (%)	196 (62.60)	102 (64.20)	94 (61.00)	0.326 <sup>b</sup>
No, n (%)	117 (37.40)	57 (35.80)	60 (39.00)	

<sup>a</sup>p-value of Pearson chi-square test.

<sup>b</sup>p-value of Fisher's exact test.

<sup>c</sup>p-value of Mann–Whitney U-test.

<sup>d</sup>Underweight defined as BMI-for-age <5th percentile [11].

<sup>e</sup>Overweight and obesity defined according the international cutoff values of BMI for age and gender [12].

<sup>f</sup>p-value of independent Student's *t*-test.

<sup>g</sup>Anemia was considered present if the hemoglobin value was below 12 g dl<sup>-1</sup> for girls and boys <14 years and <13 g dl<sup>-1</sup> for boys >14 years [2, 42].

TABLE 2  
Reported energy and macronutrients daily intake of school-aged children in East Jerusalem

Nutrient (unit)	Total (n = 313)	Male (n = 159)	Female (n = 154)	Recommended intakes <sup>a</sup>	p-value <sup>b</sup>
Energy (kcal)	1909.73 ± 886.30	2158.17 ± 944.51	1651.40 ± 742.43		0.001
Protein, % of energy	12.7 ± 8	15.4 ± 9.1	9.9 ± 5.4	12–20	0.001
Total fat, % of energy	34.7 ± 19.6	39.8 ± 21.4	29.5 ± 16.1	<30	0.001
Saturated fat, % of energy	10.3 ± 6.6	12 ± 7.5	8.6 ± 5	<10	0.001
Monounsaturated fat, % of energy	12.2 ± 5.6	14.2 ± 5.7	10.3 ± 5.4	15–20	0.001
Polyunsaturated fat, % of energy	9.4 ± 5.6	10.4 ± 5.7	8.4 ± 5.4	≤10	0.001
Carbohydrate, % of energy	54 ± 23.5	59.2 ± 24.7	48.4 ± 20.8	>55	0.001

<sup>a</sup>Ref. [42]

<sup>b</sup>p-value of Mann–Whitney U-test.

TABLE 3  
Energy and selected nutrients by school-aged children in east Jerusalem compared with RDA

Nutrient (unit)	11–14 years (n = 235)				15–16 years (n = 78)			
	Male (n = 119)		Female (n = 116)		Male (n = 40)		Female (n = 38)	
	<80% RDA (n, %)	RDA	<80% RDA (n, %)	RDA	<80% RDA (n, %)	RDA	<80% RDA (n, %)	RDA
Energy (kcal)	70 (58.82)	2500	71 (61.21)	2200	21 (52.50)	3000	26 (68.42)	2200
Protein (g)	21 (17.65)	45	45 (38.79)	46	5 (12.50)	59	18 (47.37)	44
<b>Vitamins</b>								
Vitamin A (IU)	70 (58.82)	3330	57 (49.13)	2664	17 (42.50)	3330	27 (71.05)	2664
Vitamin E (mg)	47 (39.49)	10	42 (36.21)	8	16 (40.00)	10	20 (52.63)	8
Folic Acid (µg)	16 (13.44)	150	51 (44.96)	200	3 (7.50)	150	10 (26.31)	180
Vitamin C (mg)	31 (26.05)	50	43 (37.06)	50	14 (35.00)	60	16 (42.10)	60
Vitamin B6 (mg)	78 (65.54)	1.7	72 (62.06)	1.4	23 (57.50)	2.0	26 (68.42)	1.5
Vitamin B12 (mg)	72 (60.50)	2.0	87 (75.00)	2.0	17 (42.50)	2.0	27 (71.05)	2.0
Thiamin (mg)	105 (88.23)	1.3	85 (73.27)	1.1	35 (87.50)	1.5	26 (68.42)	1.1
Riboflavin (mg)	79 (66.38)	1.5	75 (64.65)	1.3	23 (57.50)	1.8	27 (71.05)	1.3
Niacin (mg)	77 (64.70)	17	79 (68.10)	15	25 (62.50)	20	27 (71.05)	15
<b>Minerals</b>								
Iron (mg)	57 (47.89)	12	90 (77.58)	15	17 (42.50)	12	29 (76.31)	15
Calcium (mg)	113 (95.95)	1200	112 (96.55)	1200	33 (82.50)	1200	37 (97.36)	1200
Phosphorous (mg)	68 (57.14)	1200	87 (75.00)	1200	15 (37.50)	1200	31 (81.57)	1200
Magnesium (mg)	55 (46.21)	270	71 (61.20)	280	24 (60.00)	400	29 (76.31)	300
Zinc (mg)	99 (83.19)	15	97 (83.62)	12	28 (70.00)	15	34 (89.47)	12

<sup>a</sup>The RDA of <80% used, based on the Nutritional Assessment of the West Bank and Gaza Strip, 2003 [6] and according to the National Research Council, 1989 [31].

TABLE 4  
Energy intake and physical activity among different anthropometric characteristics

Dietary component (unit)		Normal weight 191 (61.00%)	Underweight 15 (4.80%)	Overweight 76 (24.30)	Obese 31 (9.90)	p-value <sup>a</sup>
Energy (kcal)	Mean ± SD	2016.12 ± 929.31	11644.11 ± 6665.87	11841.44 ± 83.51	1541.11 ± 705.70	0.021 <sup>b</sup>
Physical inactivity <sup>c</sup>						
<5 days a week,	n (%)	141 (73.80)	14 (93.3)	60 (78.90)	28 (90.30)	0.083 <sup>d</sup>
TV viewing ≥4 h a day	n (%)	50 (26.20)	2 (13.30)	21 (27.60)	7 (22.60)	0.675 <sup>d</sup>
Homework ≥4 h a day	n (%)	22 (11.50)	1 (6.70)	7 (9.20)	5 (16.10)	0.708 <sup>d</sup>
Using Computer	n (%)	117 (61.30)	6 (40.00)	49 (64.50)	24 (77.40)	0.092 <sup>d</sup>

<sup>a</sup>p-value of Kruskal–Wallis H-test unless otherwise mentioned.

<sup>b</sup>For statistically significant parameters (by Kruskal–Wallis H-test), Mann–Whitney U-test was used for multiple comparison between each pair of nutritional indices as follows: energy (obese vs normal),  $p = 0.006$ .

<sup>c</sup>Categorized based on the HBSC project [7].

<sup>d</sup>p-value Pearson chi-square.

having physical activity less than five days a week or using computer the difference in percentages of adolescents from each anthropometric category was almost significant ( $p = 0.083$  and  $p = 0.092$ ).

Cross tabulation of micro and macronutrients with anthropometric categories showed no statistical significance.

## Discussion

The present study aimed to give information about the nutritional status of school adolescents from East Jerusalem with special emphasis to nutrients.

The high participation of adolescents to the questionnaire interview indicated well awareness about nutrition related health problems in this critical age

period and good intentions to participate in this study that is the first attempt to highlight the nutritional status of adolescents.

A majority of the adolescents under study assumed that they are in good health. Boys reported themselves as healthier, which based on author knowledge could be attributed to the fact that in Arab community, families pay more attention in boys than girls including nutrition. However, this study showed that nutritional status of most children was not compatible with their health perception.

The present study found that the prevalence of being underweight among participants was 4.8% slightly lower than that of adolescents in Northern Gaza (5.3%) [2] and almost half of that in Egypt (9%) [15], while it is a bit higher than their counterparts in Israel (4.1%) [16]. The overweight percentage recorded here (24.3%) for all schoolchildren lies within the range (15–45%) estimated in Eastern Mediterranean Region [17] and almost reached the highest percentage (15–25%) derived from South Mediterranean countries [18]. A similar study in Israel also taking place around the same time found 13–15% of adolescents to be overweight that was somewhat less and a lower trend (4–9%) for obesity [19] compared to our study (9.9%). Another study conducted in an urban area of Turkey showed a considerably lower percentage of obesity (2.8%) among adolescents [20].

More than one-fifth adolescents met the criteria [2, 13] to be classified as anemic, which was slightly lower either than in preschool children [21] or pregnant women [22] in Palestine. Anemia could be either of an inheritable or a nutritional basis. Thalassemias are a fairly common reason for anemia in the Middle East (1–15%) [23]. On the other hand, lack of some nutrients (iron, B12, folic acid) intake, as shown in the present study, for prolonged period would result in anemia occurrence [24]. The latter means that adolescents, especially underweight, are vulnerable group for anemia and its complications. Our findings showed about two times less prevalence of anemia as compared with other two cross-sectional studies from Northern Gaza Strip [2] and Egypt [25] for the same age group, which could be explained by the fact that Palestinians in East Jerusalem are covered by the Israeli National Health Insurance Scheme [26]. However, anemia prevalence among adolescents in East Jerusalem is still higher than in developed countries [27]. The higher mean hemoglobin level found among boys is in line with the normal value of hemoglobin concentration for both sexes [28]. In girls there was a higher trend in anemia prevalence maybe due to that menstrual cycle has started.

The trend found in regards to physical activity of adolescents based on sex is in line with that reported from WHO [29] showing that adolescent girls are more inactive. Our findings showed that girls in East Jerusalem engage in doing homework a sitting

activity whereas boys are involved in regular outdoor activities reflected in Arab culture. This is also consistent with an international study explaining adolescents' lifestyle [30].

Gender differences in energy and macronutrient intake were observed in this study. Boys rather than girls consumed higher intakes of energy, protein, carbohydrates and total fat that are reflected by the fact that required daily intake of these dietary components is generally less in girls [31]. A high fat intake including saturated fat was reported among all study subjects. This is a health concern, especially as it is associated with obesity in children and an increased burden of cardiovascular disease later in adulthood [32, 33]. Unfavorable nutritional habits among Palestinian adolescents particularly boys have been reported previously [7].

Malnutrition is a widespread problem and an important concern for public health in Middle East [34]. Many studies have been carried out to identify the extent of this situation in different age groups like infants, preschool children, pregnant and lactating mothers. The present study has showed that a substantial percentage of Jerusalemite adolescents have not met the RDA for energy, protein and essential micronutrients such as thiamin, vitamin B12, folic acid, iron, calcium. Appropriate nutrition in puberty is important for healthy growth and chronic disease prevention in adult life [35]. It has been suggested that adequate energy and protein intake is important to ensure proper growth, development and maturation [36]. There are also increased demands for other nutrients. The available evidence suggests that both vitamin A and iron are essential for skeletal and sexual growth [37]. Calcium intake is crucial for skeletal development which is high during adolescence [38]. Another mineral, zinc, which was inadequately consumed by study's subjects (Table 3), would adversely affect the immune system and growth in lack of it [39].

It is widely known that energy balance in humans is controlled by two energy regulators, energy intake and energy expenditure [40]. The positive energy balance accompanying overweight and obese adolescents, even consuming less energy than non-overweight, could be interpreted by the fact that most of them were physically inactive leading to low energy output [41].

This study has several limitations. Although this is a small group of adolescents from the selected schools and by no means representative of the entire Palestinian population, it offers comprehensive information about the nutritional status in school adolescents in East Jerusalem. The participation of enrolled students from Israeli Municipality schools could affect the results. It does reflect the inter individual variation for most studied parameters which are observed by high standard deviations, while it does not reflect the intra participant variability

which could be achieved by applying multiple 24-h recall. The onset of puberty could be delayed in the underweight category of adolescents and checking sexual maturation stage would be important.

In conclusion, the present study showed that school adolescents in East Jerusalem are at risk of overweight, anemia and malnutrition and their health related consequences. Further research including a more representative sample of Jerusalemite adolescents is needed in order to give a broader picture of the current situation. Furthermore, a westernization of their lifestyle was indicated reflected by a high saturated and low monounsaturated fat intake in addition to physical inactivity. Education school programs promoting healthier food choices of adolescents in general and physical activity in overweight and obese in particular is a necessity.

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## CHAPTER 4.3

### **Unintentional Injuries among School- Aged Children in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)**

#### **A cross-sectional study**

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## Research Article

# Unintentional Injuries among School-Aged Children in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)

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**Purpose.** This study describes the nonfatal injuries among adolescents in Palestine. **Methods.** The 2006 Palestinian Health Behaviour in School-aged Children (HBSC) is a cross-sectional survey. Students of grades 6, 8, 10, and 12 completed a modified version of the international HBSC questionnaire, resulting in 15,963 students (47.3% boys and 52.7% girls) included in this study (56.9% from the West Bank and 43.1% from Gaza). **Results.** Of the total 15,963 adolescents, 47.6% were injured, with boys (53.5%) being statistically higher than girls (42.1%) ( $P < 0.001$ ). The prevalence of those injured more than once decreased by age and was also found significantly higher in boys than in girls (27.3% and 17.9%, resp.) ( $P < 0.001$ ). Children living in low FAS families showed significantly lower ratios of injuries than those living in moderate and high FAS families ( $P < 0.001$ ). Injuries while biking were significantly higher among boys (46.3%) than girls (41.7%) ( $P < 0.001$ ), and injuries while walking/running were more prevalent among girls (32.5%) than boys (28.0%) ( $P < 0.001$ ). **Conclusion.** Despite these considerably high rates, injury remains relatively underappreciated. Results of this study are useful to develop a national injury prevention program aimed at enhancing the safety of Palestinian adolescents.

## 1. Introduction

Injuries are the world's leading cause of morbidity and mortality among children and adolescents [1]. According to the World Health Organization report of 2008, injury is a leading cause of the global burden of disease; injuries are responsible for more than 950,000 deaths every year among those under 19 years of age, from which at least 60 percent are attributed to unintentional causes. However, the differences such as the extent, pattern, distribution, risk, and determinants between the intentional and unintentional home, school and road-related childhood, and young adulthood injury hazards are not well understood [2].

Many studies had focused on the typology of injuries and their socio-economic status correlates [3, 4] particular types of injuries, such as sport injuries [5], the association between

family stress and injuries [6], risk behaviors and injuries [7], violence and injuries [4, 8], and other psychosocial determinants [4, 9, 10]. Despite the enormous public health burden imposed by child and adolescent injury, several studies had shown that 71–95% of injuries could be prevented by simple and reasonable means [11, 12]. In developed countries such as Australia, Sweden, Britain, and Canada, injury rates has been reduced by up to 50% over the past three decades using multisectoral approaches to prevention [13]. In developing countries, studies have been largely limited to hospital-based information which provides information on severe injuries [14, 15].

A population-based survey of adults 18–65 years residing in Aleppo, Syria, conducted in 2004 founds that falls and traffic injuries have caused the highest morbidity ratios



among the injured, while burns, although not frequently reported, were associated with the severity of injury in the majority of cases [16]. A recent report in 2008 about the incidence of home accidents in Palestinian and Israeli communities stated that falls were the most common cause of injury reported by parents surveyed (35% in the Palestinian community and 31% in the Bedouin community); the majority of these accidents occurred among boys (60% in the Bedouin community and 70% in the Palestinian community) with the yard, living room, and kitchen as places with greatest number of accidents [17]. Another main site of accidents for the Palestinian population was the stairs—a site not relevant in the Bedouin homes. In the Bedouin community, burns represented an equal proportion of injuries to falls, significantly higher than the proportion found in the Palestinian survey (31% versus 11%) or in the international literature. Analysis of the circumstances of these accidents reveals that most were related to the use of an open fire for cooking and heating, which are common to the Bedouin lifestyle [17].

The Palestinian Ministry of Health (PMOH) reported that in 2004 accidents were the leading cause of death for children aged 1–4 and 5–19 years with a proportion of 24.2%, and 29.2%, respectively of the total deaths [18]. And although children constitute 52.6% of the Palestinian total population [19], there is little literature on unintentional injuries in Palestine. Therefore, the Palestinian Health Behavior in School-aged Children (PHBSC) survey offers for the first time the opportunity to study the Palestinian adolescents' unintentional injuries in grades 6, 8, 10, and 12. The intent of this analysis was to estimate the prevalence rate of injuries, severity of injuries, settings in which injuries occur, and the activity context of injury events occurring to Palestinian adolescents as well as to compare the results of this study with studies from other countries which used similar type of research and target group to be used as a model to develop future injury surveillance methods to track injuries and their risk factors. This study is essential for understanding the extent of the injuries problem to inform both public policy and prevention strategies.

## 2. Methods

**2.1. Target Population and Sample.** The estimated population of Palestine in 2006 was 3,761,646 people (West Bank = 2,345,107 and Gaza Strip = 1,416,539) [20]; the total numbers of youth aged 10–14 and 15–19 were 514,997 and 429,276, respectively. The schooling system in Palestine is comprised of two stages: a basic stage that involves children aged 6 to 16 years and a secondary stage of children aged 17 to 18 years. In 2006, there were 2,277 schools in Palestine (1726 government-run, 279 United Nations Relief and Works Agency (UNRWA), which provides education, among other services, to Palestinian refugees living in the Gaza Strip and the West Bank, and 272 private schools) with a total number of 31,019 classes (22,110 government, 6107 UNRWA, 2802 private) [21]. The total number of children enrolled in basic education during the scholastic year 2005/2006

was 944,713, while 122,776 students were enrolled in the secondary education [21].

Selected students were chosen using a stratified, two-stage cluster sampling. The sample was stratified according to region (West Bank and Gaza Strip), school types (government, private, and UNRWA), and school grades (6th, 8th, 10th, and 12th). Assuming an average class size of 35 students, the aim was to recruit 4,000 students at each grade level, from both regions, to produce a sample size of around 16,000 students. A two-stage cluster sampling technique was used with the school as the primary sampling unit. In the first stage, 405 schools were selected randomly with probability proportional to their size (size defined as number of classes in the school). The list of the schools and number of classes in each school, for the academic year 2005/2006, were obtained from the Ministry of Education. All of the randomly selected schools ( $n = 405$ ) agreed to participate. The response rate was 97.3% among 16,400 students who participated on data collection, leaving a sample size of 15,963. In the second stage, one class was selected at random from each school. Each of these classes was defined as a cluster, where all the students in the selected class were eligible for inclusion. The aim was to survey one class per school. However, in schools where boys and girls were studying in separate classes, two classes were selected, one for boys and another for girls. This resulted in a total of 481 classes being selected overall.

**2.2. Data Collection and Questionnaire.** The questionnaire was developed using the WHO international HBSC questionnaire (2001–2002) including all mandatory HBSC questions [22]. The questionnaire was double cross translated to Arabic; it was tested in two independent preliminary studies using in-class administration as well as focus-group discussions to demonstrate reliability and validity prior to the administration of the national representative full survey.

In addition to the major variables addressed in the survey (demographics, general health, well-being, family and peer relationships, school environment, exercise and leisure-time activities, diet, smoking, exposure to political violence, and mental health) [23–25], the questionnaire contained additional optional packages; half of the optional components of the questionnaire (Form A) contained optional questions on violence, injuries, and social inequalities, and the other half of the questionnaire (Form B) contained optional questions on physical activity, eating, dieting, and mental and physical health. Equal numbers of Form A and Form B were randomly distributed in each school class. However, the injury filter items were asked to all sampled students. The survey was conducted anonymously in the West Bank and Gaza through self-completed questionnaires between April–May of 2006.

In each school, the student advisor distributed the questionnaires in the classroom and was instructed to respond to the students' enquiries about the procedure. School children completed the questionnaires independently during one school period, lasting 45 minutes. Data collection was conducted by Al-Quds Nutrition and Health Research Institute (ANAHRI) in Al-Quds University.

### 2.3. Main Measures

**2.3.1. Injury.** Students were asked to report injury events that required medical attention from a doctor or a nurse in the past 12 months [26]. Response options were “I was never injured in the past 12 months,” “once,” “twice,” “three times” and “four times or more”. Students who reported one or more injuries were defined as being injured. Respondents who reported at least one injury were requested to answer a series of questions related to the circumstances and consequences of the injury event. Respondents who reported two or more injuries were asked to select the “single most serious injury during the past 12 months” and were requested to answer the following questions referring to that “most serious injury”. The most serious injury was defined as the injury that took the most time to get better [10, 27–29].

The information obtained referred to the timing of the injury (month and year), setting where the injury occurred (e.g., home, school, street), the activity context (e.g., biking, sports, fighting), and consequence (e.g., loss of activity days or school days, hospitalization, etc.).

**2.3.2. Family Affluence Scale (FAS).** Family Affluence Scale (FAS) was developed by the WHO Health Behaviour in School-Aged Children Study. This scale deduced the levels of material wealth by calculating points to “owning a car,” “owning a computer,” “sharing a bedroom,” and “travelling while on holiday.” A sum score was calculated for each student and categorized as (i) low FAS (score = 0–2); (ii) medium FAS (score = 3–5); (iii) high FAS (score = 6–9) [30].

**2.3.3. Parents' Educational Level.** This is based on adolescents self-reports and is divided into four levels: (1) did not graduate from high school; (2) graduated from high school; (3) continued studies after high school but not in the university; (4) studied in university or graduated from university. Responses are categorized into (A) low education—a combination of 1 + 2 and (B) high education—a combination of 3 + 4.

**2.3.4. Parents' Occupation.** A more direct measure of the family economic situation was derived from a question reporting the current occupation status of the parents. This is based on adolescents self-reports and responses were 1—yes; 2—no; 3—do not know; 4—do not have/do not see the father/mother. In the analysis, do not know or do not have/do not see the father/mother were combined in one category.

**2.3.5. Activity During Injuries.** Participants were asked to choose their activity when the accident occurred. Response options included “biking/cycling, sports activity/recreational activity, walking/running (not for a sports team or exercise), fighting, paid or unpaid work, and other.” Location of injuries was asked, and the response options included “home or yard, school, including school grounds, sports facilities, or fields, street, and road.”

**2.4. Ethical Considerations.** The 2006 Palestinian HBSC survey was approved by Al-Quds University Ethical Committee

and the Research Ethics Board of the Palestinian Ministry of Education.

**2.5. Statistical Analysis.** Percentages for injuries have been calculated on the basis of sociodemographic characteristics (grade, gender, region, school ownership, and FAS). Chi-square test was used to compare differences in injuries among adolescents by sociodemographic characteristics. Analysis was performed using SPSS Version 20. A significance level of  $P < 0.05$  was used.

## 3. Results

The total number of students included in this study is 15,963, from which 52.7% are girls and 47.3% are boys. More than half the participants resided in the West Bank (56.9%). The majority of the students' fathers and mothers had low education level (75.6% and 65.5%, resp.), and 71.8% of the fathers were working, while 71.5% of mothers were housewives. Based on the Family Affluence Scale (FAS), 66.6% of the students' families have low economic situation and 79.5% of the adolescents attend government schools (Table 1).

Table 2 presents the percent of students reporting one or more medically attended injury during the past 12 month by grade, gender, region, school ownership, and FAS. Of the total (15,963) participants, 47.6% were injured (53.5% boys versus 42.1% girls). About one quarter (25.2%) of the participants reported one injury and with boys higher than girls (26.2% and 24.2%, resp.) ( $P < 0.001$ ). Whereas, 22.4% reported two or more medically attended injuries during the past 12 months. The prevalence of those injured more than once decreased by age and was found significantly higher in boys than in girls (27.3% and 17.9%, resp.) ( $P < 0.001$ ). Adolescents attending UNRWA schools showed significantly higher ratios of injuries in both single and multiple injuries than other schools. Adolescents living in families with low FAS reported significantly lower ratios of injuries than those living with moderate and high FAS families ( $P < 0.001$ ).

Loss of activity days due to the injury was used as an indicator of more severe injuries. About half of all reported injuries (42.4%) were severe enough to cause loss of at least one day of school or other activities. This proportion significantly decreased by grade ( $P < 0.001$ ) and was significantly higher among boys than girls (47.2% and 37.0% resp.) ( $P < 0.001$ ).

The most frequent activity in which injuries occurred was biking (44.2%) and among boys (46.3%) more than among girls (41.7%). Injuries while walking/running were more prevalent among girl (32.5%) than among boys (28.0%). About one out of every five injury events occurred during fighting.

Home injuries has the highest ratio (78.5%) followed by school (9.0%) and streets (4.2%) (Figure 1). There was no significant difference between the injury setting (home, school, sport facility, and street) and the sociodemographic characteristics (age, gender, region, school ownership, and FAS), while there was significant difference between organized activity and injury setting with sport facilities being the highest 47.0% (Figure 2).

TABLE 1: Characteristics of participants ( $n = 15963$ ).

Characteristics	<i>n</i>	%
Grade		
6th	4263	26.7
8th	4124	25.8
10th	4113	25.8
12th	3463	21.7
Gender		
Boys	7551	47.3
Girls	8412	52.7
Region		
West Bank	9077	56.9
Gaza Strip	6886	43.1
School ownership		
Private	1243	7.8
Government	12688	79.5
UNRWA*	2032	12.7
Family Affluence Scale (FAS)		
FAS 1 (low)	9494	66.6
FAS 2 (moderate)	3259	22.9
FAS 3 (high)	1502	10.5
Father's education		
Low education	10833	75.6
High education	3488	24.4
Mother's education		
Low education	9466	65.5
High education	4980	34.5
Father's occupation		
Yes	10398	71.8
No	3006	20.8
Do not know or do not have/do not see the father	1075	7.4
Mother's occupation		
Yes	3054	21.2
No	10280	71.5
Do not know or do not have/do not see the mother	1044	7.2

\* UNRWA: United Nation Relief Working Agency.

#### 4. Discussion

The overall prevalence of Palestinian adolescents who were injured at least once during the past 12 months from conducting the survey was 47.6% of the total, and injuries among boys (53.5%) were higher than among girls (42.1%). These results are consistent with results from European countries, USA, and Israel that boys have more injuries than girls [4, 9, 10, 16, 31–33].

Although there was variation between countries, injuries between Palestinian adolescents were less than Spain (63.9% boys and 50.7% girls), Germany (58.1% boys and 50.3% girls), Austria (58.0% boys and 47.9% girls), USA (56.9% boys and

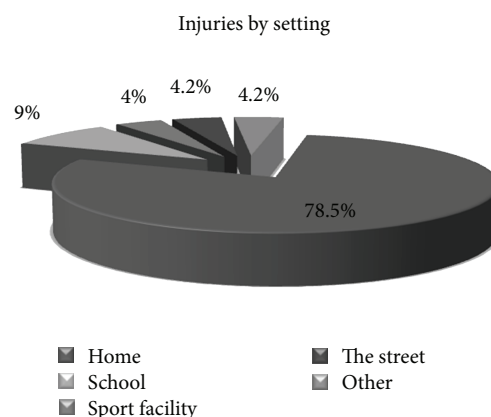


FIGURE 1: This graph shows the prevalence of injury by setting.

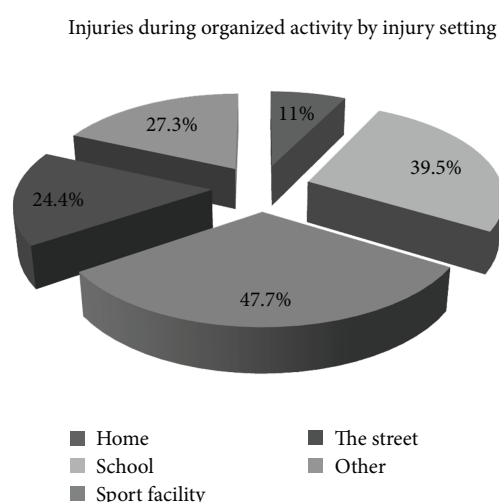


FIGURE 2: This graph shows the prevalence of injury according to injury setting as well as the percentage of injuries during organized activity in each category.

47.6% girls), and Israel (62.1% boys and 46.3% girls) [4]. While the results from this study were closer to results from Slovenia (54.3% boys and 40.3% girls) and Switzerland (54.0% boys and 43.1% girls). Furthermore, this showed higher prevalence of injuries than Poland (33.4% boys and 23.3% girls), Ukraine (37.2% boys and 24.6% girls), and Greenland (36.4% boys and 25.5% girls) [4].

The operational definition of an injury in this study is an injury that was treated by a doctor or a nurse. Therefore, the relatively lower-than-expected injury rate shown for Palestinian students compared to some other European countries, Israel, and USA can be explained by one or more of the following reasons: (1) lower injury rates, (2) less access to medical care, and (3) less utilization of medical care. Consequently, unattended Palestinian adolescents' injuries might be underreported.

This study found that adolescents living in high FAS families reported high prevalence of injuries (51.9%) while those living in low FAS families reported low injuries (45.1%), which is consistent with the results from the cross-national

TABLE 2: Distribution of students reporting medically attended injuries during the past 12 months by number of injuries, activity context, and selected sociodemographic variables.

	Number of injuries		Treated by cast, stitches, operation, or overnight hospitalization		Lost days of activity		Activity context				P value		
	Injured 1	Injured >1 n (%)	P value	n (%)	P value	n (%)	Biking	Sport	Walking/ running	Fighting		Work	Other
Grade													
6th	1117 (26.2)	1260 (29.5)		422 (39.2)		964 (45.7)	1131 (47.6)	267 (11.2)	656 (27.6)	109 (4.6)	47 (2.0)	167 (7.0)	
8th	1149 (27.9)	1028 (25)	<0.001	361 (33.7)	<0.001	842 (43.2)	966 (44.4)	288 (13.2)	643 (29.5)	79 (3.6)	35 (1.6)	166 (7.6)	<0.001
10th	927 (22.5)	738 (17.9)		230 (32.1)		601 (41.3)	643 (38.6)	202 (12.1)	580 (34.8)	73 (4.4)	30 (1.8)	137 (8.2)	
12th	822 (23.7)	551 (15.9)		203 (29.4)		418 (36.5)	613 (44.6)	160 (11.7)	408 (29.7)	53 (3.9)	32 (2.3)	107 (7.8)	
Total	4015 (25.2)	3577 (22.4)		1216 (34.2)		2825 (42.4)	3353 (44.2)	917 (12.1)	2287 (30.1)	314 (4.1)	144 (1.9)	577 (7.6)	
Gender													
Male	1976 (26.2)	2060 (27.3)	<0.001	757 (40.2)	<0.001	1669 (47.2)	1870 (46.3)	476 (11.8)	1130 (28.0)	177 (4.4)	92 (2.3)	291 (7.2)	<0.001
Female	2039 (24.2)	1547 (17.9)		459 (27.5)		1156 (37.0)	1483 (41.7)	441 (12.4)	1157 (32.5)	137 (3.9)	52 (1.5)	286 (8.0)	
Total	4015 (25.2)	3577 (22.4)		1216 (34.2)		2825 (42.4)	3353 (44.2)	917 (12.1)	2287 (30.1)	314 (4.1)	144 (1.9)	577 (7.6)	
Region													
West Bank	2221 (24.5)	1989 (21.9)	0.002	666 (34.0)	0.780	1565 (42.2)	1836 (43.6)	512 (12.2)	1257 (29.9)	189 (4.5)	86 (2.0)	330 (7.8)	0.352
Gaza Strip	1794 (26.1)	1588 (23.1)		550 (34.5)		1260 (42.7)	1517 (44.9)	405 (12.0)	1030 (30.5)	125 (3.7)	58 (1.7)	247 (7.3)	
Total	4015 (25.2)	3577 (22.4)		1216 (34.2)		2825 (42.4)	3353 (44.2)	917 (12.1)	2287 (30.1)	314 (4.1)	144 (1.9)	577 (7.6)	
School ownership													
Private	303 (24.4)	268 (21.5)		915 (33.2)		2187 (42.2)	280 (49.0)	62 (10.9)	153 (26.8)	25 (4.4)	9 (1.6)	42 (7.4)	
Government	3148 (24.8)	2731 (21.5)	<0.001	192 (37.4)	0.045	460 (45.1)	2502 (42.6)	729 (12.4)	1830 (31.1)	252 (4.3)	124 (2.1)	442 (7.5)	<0.001
UNRWA *	564 (27.8)	578 (28.4)		109 (38.8)		178 (39.1)	571 (50.0)	126 (11.0)	304 (26.6)	37 (3.2)	11 (1.0)	93 (8.1)	
Total	4015 (25.2)	3577 (22.4)		1216 (34.2)		2825 (42.4)	3353 (44.2)	917 (12.1)	2287 (30.1)	314 (4.1)	144 (1.9)	577 (7.6)	
FAS**													
Low	2345 (24.7)	1942 (20.4)		650 (32.8)		1521 (39.7)	1915 (44.7)	507 (11.8)	1307 (30.5)	169 (3.9)	73 (1.7)	316 (7.4)	
Moderate	818 (25.1)	824 (25.4)	<0.001	284 (37.0)	<0.001	674 (45.4)	733 (44.6)	202 (12.3)	468 (28.5)	78 (4.8)	38 (2.3)	123 (7.4)	0.648
High	363 (24.2)	417 (27.7)		146 (40.1)		327 (45.9)	343 (44.0)	92 (11.8)	229 (29.4)	32 (4.1)	17 (2.2)	67 (8.6)	
Total	3526 (24.7)	3183 (22.3)		1080 (34.7)		2522 (41.8)	2991 (44.6)	801 (11.9)	2004 (29.9)	279 (4.2)	128 (1.9)	506 (7.5)	

\*UNRWA: United Nation Relief Working Agency.

\*\*FAS: Family Affluence Scale.

Chi-square test.



analyses that students living in low income countries reported low injury rates (e.g., Bulgaria, Romania, Slovenia) [4]. However, some researchers found contradictory results which showed that the higher the income is, the lower the death and injuries are [34, 35]. This is the same argument used to explain the difference of injury rates among US adolescents with different SES levels [34] and undergraduate students from China [35]. As well, this study found that those living in families with higher FAS suffered from more injuries during organized activities than other students. This may be explained by the fact that richer students tend to participate more in organized activities. These results are consistent with results from another study [4].

This study shows that injury rates decreased by age: 55.7% for 6th grade to 39.6% for 12th grade students. These results are concurrent with most previous studies of nonfatal injuries among school adolescents [9, 10, 27]. Since Gaza Strip is a high density area with poor infrastructure, it was quite astonishing to find that injury rates were similar in both the West Bank and Gaza Strip. However, a significant difference was found ( $P < 0.001$ ) in the probability of being injured between the different types of schools: private schools (45.9%), government schools (46.3%), and URWA schools (56.2%). Most likely, this is a reflection of the composition of populations and types of neighborhoods that are served by each type of school.

In Palestine, the home was the commonest place where injuries occurred (78.5%) to be followed by the school (9%). Many authors in this field documented the importance of the home environment in the causation of injuries [36, 37]. And although the streets are dangerous for adolescents, this study shows that there are more hazards at home.

The vast majority of injuries among the participants were due to biking (44.2%; boys: 46.3% and girls: 41.7%) to be followed by running/walking (30.1%; boys: 28.0% and girls: 32.5%). The predominance of sport injury among boys is consistent with many previous studies [10, 27, 32]. In this context, studies from Jordan and Israel reported falls as the predominant cause of injury among adolescents [38, 39].

This is the first study to investigate unintentional injuries in Palestine. It looked at a large population of school-aged children and is considered to be the baseline for future studies. The HBSC questionnaire items were developed continuously over several years and are supported by validation efforts [26, 40]. The ability to examine relations between different social measures and a variety of injury types is an additional strength. Despite the strength of this study, it was a cross-sectional study, which is not strong enough to draw any causal inferences. As well, it was a self-reported school-based survey that suffers from several methodological limitations mainly: (1) recall bias, (2) "soft" measures of injury, and (3) lack of detailed etiology [29].

The problem of recall bias was discussed in depth in Harel et al., (1994) [29] showing two distinct reasons for recall bias—memory decay, resulting in loss of memory of injury events and "telescoping," resulting in inclusion of injury events that occurred outside the recall period (e.g., 13 months ago). The conclusions of Harel et al., [29] were that using a 12-month recall measure results in conservative annual

estimates due to memory loss regarding minor injuries that occurred more than 3-4 months ago.

The "soft" nature of the injury measures was also discussed in previous studies [10, 28, 29]. During the past two decades, these survey items have been validated and used on many national and international surveys and have become the international standard for calculating childhood injury rates based on survey methodology [3, 8, 33].

As a comprehensive survey, the HBSC includes a breath of topics related to the health and well-being of schoolchildren. As such, in-depth information on the exact circumstances (such as burns and poisoning) leading to individual injury events cannot be obtained. Therefore, the depth of the analyses, in terms of the etiological circumstances, is quite limited.

Injuries are a major public health issue and one that can be addressed like any other disease process that can be studied, treated, and most importantly, prevented. This study provides the first estimates of injuries among school-aged children in Palestine. It shows that injuries are common among Palestinian adolescents and despite these alarming statistics, injury remains relatively underappreciated by Palestinian health care providers, government, and the general public. We propose that Palestinian health and educational authorities should initiate the development of a national injury prevention program aimed at enhancing the safety of Palestinian school adolescents and educating the families on how to make the homes environment as safe as possible.

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## CHAPTER 4.4

### **Labor and Related Injuries among Schoolchildren in Palestine: Findings from the National Study of Palestinian Schoolchildren (HBSC-WBG2006)**

**A cross-sectional study**

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**Labor and Related Injuries among Schoolchildren in Palestine:  
Findings from the National Study of Palestinian Schoolchildren  
(HBSC-WBG2006)**

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## **ABSTRACT**

**Background:** Labor related injuries among Palestinian schoolchildren are a significant undocumented public health concern. This study aimed at documenting the prevalence and nature of work related injuries among schoolchildren as well as identifying socio-demographic factors that predict these injuries.

**Methods:** A cross-sectional survey included 15,963 children of whom 6458 (40.8%) completed an optional package related to labor. Students from a representative sample of grades 6, 8, 10 and 12 (aged 12–18 years) self-completed a modified version of the international World Health Organization collaborative Health Behaviour in School-aged Children valid questionnaires between April-May of 2006.

**Results:** Approximately 73.8% of the students who filled the optional package reported working during the last 12 months, from whom 79.1% sustained a work related injury. Work injuries were significantly higher among boys, younger children, children enrolled in UNRWA Schools and living in Gaza Strip ( $P < 0.05$ ). Children working  $\geq 3$  hours/day were more likely to experience injuries 1.73 (95% CI, 1.53-1.95) than those working  $\leq 3$ /day. About half of the children worked in retail trade (51.5%), agriculture (20.0%) and cleaning (11.4%). Injury type was related to the type of work performed.

**Conclusions:** The high prevalence of injuries among working schoolchildren in Palestine confirms its severity as a public health problem. In order to reduce occupational injuries, policymakers and professionals should develop intervention programs that target the public and health providers.

**Keywords:** Labor, injuries, schoolchildren, Palestine

## INTRODUCTION

Child labor is prevalent worldwide (Scanlon et al., 2002; Zierold et al., 2004). Schoolchildren who work are particularly vulnerable because their roles within various institutional structures are often subject to dramatic developmental shifts and normative crises. Family, school and work subject adolescents to differing and sometimes contradictory degrees of autonomy, responsibility, purposefulness and inadequate adult supervision (Clausen, 1991).

Young workers run a higher risk of work injuries arising from lack of experience, limited awareness of existing or potential risks or immaturity (Runyan et al., 2000). Working methods, tools and equipment are normally designed for adults and do not take into account the smaller body size of the child worker. Thus, children and young people are at a greater risk of fatigue, injury and accidents because of ill-fitting tools and safety equipment (ILO, 2007).

Although there is enough research evidencing socioeconomic disparities as a risk factor for unintentional injuries among adolescents (i.e., pedestrian, recreational) (Chen et al., 2006; Brownell et al., 2002; Danseco et al., 2000; Faelker et al., 2000; Potter et al., 2005; Hawamdeh & Spencer, 2001); very few have considered whether such disparities exist in work related injuries (Kimberly et al., 2008). In examining individual level risk factors, studies have found that disparities exist by gender and age (Institute of Medicine, 1998) as well as ethnicity (Zierold et al., 2006).

A household survey conducted by the Palestinian Center Bureau of Statistics in 2000 estimated the number of children in the 10-17 age group at 605,409. The percentage of documented employed children was 5.5% (n=33,298), of whom 38.4% were not enrolled in schools (PCBS, 2001). The study indicated that 24.0% of these youth worked in the commercial sector including restaurants, 20.0% in mining, quarries and manufacturing industries, 30.4% in agriculture, and 18.0% in construction. The percentage of children who worked for more than 6 hours a day was 73.2% (PCBS, 2001).

Currently, it is estimated that about 40,000 children under 18 are engaged in some form of labor activity in Palestine (PCBS, 2006). The Palestinian Labor Law effective since mid-2000, sets the age for admission to employment at 15 years, and stipulates a number of restrictions on work for children 15-18 years old (Palestinian Ministry of Labour,

2002; Boulifeh, 2000). However, since the outbreak of the Intifada (uprising) in September 2000, the socioeconomic situation has deteriorated greatly, presumably giving rise to increased child labor. The concept of child labor itself was considered by some of the families and the children as a “positive form of solidarity”, rather than a violation of the rights of the child (Development Studies Programme, 2004). Some employers even prefer students as employees because their age/inexperience makes them less paid, more obedient, easier to manage and less aware of their rights. They also escape from the requirement to pay employment insurance when they employ juveniles.

Little information exists on injury and factors associated with injury among Palestinian working schoolchildren. The lack of national data regarding working schoolchildren aged 12–18 years prompted this study to document the prevalence and nature of work related injuries among children as well as to identify socio-demographic factors that predict these injuries.

## **METHODS**

### **Participants**

The selected sample was stratified according to region (West Bank and Gaza Strip), school types (government, private and UNRWA) and grades (6<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup>) and it excluded school-aged children who did not attend school. Assuming an average class size of 35 students, the aim was to recruit 4000 students at each grade level, from both regions, to produce a sample size of around 16000 students. A two-stage cluster sampling technique was used with the school as the primary sampling unit. In the first stage, 405 schools were selected randomly with probability proportional to their size (size defined as number of classes in the school). The list of the schools and number of classes in each school, for the academic year 2005/2006, was obtained from the Ministry of Education. All of the randomly selected schools (n=405) agreed to participate. The response rate was 97.3% among 16400 students who participated on data collection, leaving a sample size of 15963 of whom 6458 (40.8%) completed the optional package related to labor. In the second stage, one class was selected at random from each school. Each of these classes was defined as a cluster, where all the students in the selected class were eligible for inclusion. The aim was to survey one class per school. However, in schools where boys

and girls were studying in separate classes, two classes were selected, one for boys and another for girls. This resulted in a total of 481 classes being selected overall.

## **Instruments**

The questionnaire was developed using the WHO international HBSC questionnaire (2001–2002) including all mandatory HBSC questions (Currie et al., 2002). The questionnaire was translated into the native language (Arabic), Changes in wording were made to clarify the meaning of certain questions; however, in order to maintain comparability with other countries, the questionnaire changes were kept to a minimum. It was tested in two independent preliminary studies using in-class administration as well as focus-group discussions to demonstrate reliability and validity prior to the administration of the national representative full survey.

In addition to the major variables addressed in the survey (demographics, general health, well-being, family and peer relationships, school environment, lifestyle, exposure to political violence and mental health) (Harel & Abdeen, 2003; Abdeen & Qasrawi, 2007; Harel & Abdeen, 2008), the questionnaire contained additional optional packages: half of the optional components of the questionnaire (Form A) contained questions on violence, injuries, and social inequalities; and the other half of the questionnaire (Form B) contained optional questions on lifestyle, mental, labor and physical health. Equal numbers of Form A and Form B were randomly distributed in each school class. However, the injury filter items were asked to all sampled students. This article presents data from 6458 questionnaires (Form B) which included the mandatory HBSC questions as well as optional questions on lifestyle, mental, labor and physical health.

*Socio-demographic* characteristics: included individual factors, such as gender, grade (6<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> or 12<sup>th</sup>), region (West Bank or Gaza Strip), School Ownership (government, private or UNRWA), Family affluence scale (FAS) (low, moderate and high) (Boyce et al., 2006) and parental education level (low and high).

*Work intensity*: <3hours/day, ≥3hours/day.

*Primary labor:* a) Agricultural work, b) retail trade, c) Street traders (selling newspapers, magazines, beverages and sweets), d) Tool maintenance work (repairing equipment or tools), e) Cleaners, f) movement of goods, g) Work in building construction and maintenance, h) Workshops like carpentering, mechanics, aluminum, i) House work.

*Work shift:* (a) During School hours, (b) After School hours, (c) On the Weekend, (d) In the Semester or annual vacations.

*Types of injuries:* The occurrence of injury was measured using a question “Did any of the following happen to you in the previous 12 month because of your work? a) Pain in the back, b) Muscle pain, c) Injuries, deep scratches, or wounds, d) Bone Fractures, e) Eye injuries, f) Exposure to poisonous or burn-causing materials, g) other. More details regarding the types of injuries was found in a previously published article (Jildeh et al., 2013).

## **Procedure**

Selected schools were informed about the survey by sending a letter to the school principle. All school principals agreed to participate. In each school, the student advisor distributed the questionnaires in the classroom and was instructed to respond to the students’ enquiries about the procedure. School children completed the questionnaires independently during one school period, lasting 45 minutes. The survey was conducted through self-completed questionnaires and data were collected anonymously in the West Bank and Gaza Strip by Al-Quds Nutrition and Health Research Institute (ANAHRI) in Al-Quds University between April-May of 2006. The 2006 Palestinian HBSC survey was approved by Al Quds University Ethical Committee and the Research Ethics Board of the Palestinian Ministry of Education.

## **Data analysis**

Data analysis was performed using the SPSS statistical package version 20 (SPSS Inc, Chicago, IL, USA). Chi-square test was used to compare differences in work status, type of work and related injuries among adolescents by several socio-demographic characteristics. Univariate and multivariate logistic regression models were used to assess the association between work injury and work intensity, work shift, type of work and

socio-demographic characteristics. Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) were derived. A significance level of  $P<0.05$  was used.

## RESULTS

### Sociodemographic Characteristics

The average age of the schoolchildren was 15.1 years, 28.4% of them were in grade 6, 26.6% in grade 8, 24.0% in grade 10 and 20.9% were in grade 12. More than half of the working children resided in the West Bank (55.4%) while the rest resided in Gaza Strip (44.6%). A high percentage of parents whose children were employed, had low educational levels (70.9% of the fathers & 64.4% of the mothers). Of all respondents, 73.8% ( $n=4765$ ) reported working during the last 12 months (Private Family Business 25.2%, in houses 50.6%, in an organization 3.9%, in industrial areas 3.0%, in farms 3.1%, in building workshops 2.8%, in a cafeteria/shop/market 1.4%, in the streets 0.9%, different varied places 9.1%), more than two thirds of them were boys (70.9% boys vs 29.1% girls).

Approximately half of the children (52.8%) reported working  $\geq 3$  hours/day while 47.2 % were employed for  $<3$  hours/day. High work intensity was significantly higher among boys than girls (57.4% vs. 41.7% respectively,  $P<0.05$ ). From all working children, 79.1% reported an occupational injury (boys 81.7% vs. girls 73.0%,  $P<0.05$ ). About one quarter of boys (26.8%) reported current/recent employment after school hours while 22.7% of girls. This trend was observed in working during school vacations holidays (21.3% boys vs. 14.3% girls respectively) ( $P<0.05$ ). The highest prevalence of injuries was noticed among 6<sup>th</sup> grade students (82.6%) ( $P<0.05$ ), children from UNRWA schools (82.3%) ( $P<0.05$ ) and those living in Gaza (81.6%) ( $P<0.05$ ). More students from 8<sup>th</sup> grade reported working before school hours and on weekends while more students from 6<sup>th</sup> grade reported working during school hours and students from 10<sup>th</sup> grade on the summer holidays ( $P<0.05$ ). A significantly highest proportion of children from government schools (47.7%), West bank (49.1%) and poor families (50.1%) reported working less than 3 hours per day ( $P<0.05$ ) while from private schools (41.5%), Gaza

Strip (44.8%) and rich families (39.8%) reported employment 3 hours daily or more (Table 1).

Table 2 indicates that most employed students reported working for pay: 51.5% of the students worked in retail trade (boys 46.0% vs. girls 61.5%); 20% worked in agriculture (boys 22.9% vs. girls 14.2%), students working cleaners were (boys 3.3% vs. girls 2.9%) ( $P<0.05$ ). More boys than girls worked in construction/mechanical or maintenance (3.4% boys vs. 1.0% girls), followed by street traders (7.3% boys vs. 5.7% girls), movement of goods (3.7% boys vs. 1.2% girls) and workshops (2.0% boys vs. 0.7% girls) ( $P<0.05$ ), while the contrary happened in concern to house work (6.9% boys vs. 10.8% girls,  $P<0.05$ ). Street traders came mainly from the 8<sup>th</sup> grade (8.9%,  $P<0.05$ ), while those working in agriculture production from 6<sup>th</sup> (21.0%) and 12<sup>th</sup> grades (21.0%) ( $P<0.05$ ). More students from governmental schools were employed in the agricultural production (20.5%) while more students from private schools worked in building construction/maintenance (5.1%) and workshops (3.3%) ( $P<0.05$ ). More children from the West Bank were involved in agricultural production (21.0%), house work (9.3%), building construction/ maintenance (3.1%) and workshops (1.9%), while children from Gaza were more involved in retail trade (54.9%), tool maintenance work (3.6%) and movement of goods (3.0%) ( $P<0.05$ ). In both West Bank and Gaza a significantly ( $P<0.05$ ) higher proportion of schoolchildren from poorer families worked in retail trade (53.8%) and house work (9.3%) whereas those from richer families worked in agricultural production (23.3%), building construction (3.6%) and workshops (1.7%).

Table 3 presents the type of work injury in relation to type of work. Back pain was reported in higher frequency among working schoolchildren (33.0%) during their participation in agricultural production, muscle pain during construction/mechanical or maintenance (19.8%) and deep scratches or wounds during tool maintenance work (20.7%) ( $P<0.05$ ). Higher proportions of bone fractures (16.2%) and eye injuries (13.2%) were found among cleaners ( $P<0.05$ ). Finally, exposure to poisonous or burn causing materials was found to be more frequently reported among children implicated in workshops ( $P<0.05$ ).

Table 4 presents the univariate and adjusted odds ratios for work injury by work intensity, work swift, type of work and socio-demographic characteristics. After controlling for gender, grade, region, parent educational level and Family Affluence Scale (FAS), schoolchildren working at least 3 hours per day were 1.73 times more likely of getting injured than those working less than 3 hours per day. Working during, before and after school hours as well as during weekend was found to increase the likelihood for injuries compared to working during school vacations ( $P<0.05$ ). Schoolchildren working as cleaners and in workshops were 0.48 and 0.95 less likely of getting injured than those in agricultural production. Contrarily, children working in retail trade, street traders and involved in house work were 1.61, 2.56, and 1.39 more likely of getting injured respectively than those in agricultural production. Boys were 1.56 more likely for getting injured than girls. On the other hand, 8<sup>th</sup> to 12<sup>th</sup> grade students had decreased likelihood of injury than their 6<sup>th</sup> grade counter parts ( $P<0.05$ ).

## DISCUSSION

### *Prevalence*

According to the authors' knowledge, this is the first national survey to document the labor experiences of Palestinian schoolchildren. More specifically, 73.8% of the students reported being engaged in labor during the past 12 months. Moreover, among Palestinian schoolchildren workers, 47.1% reported working less than three hours daily (less than 15 hours weekly if extrapolated over five work days) and 52.8% more than three hours daily (more than 15 hours weekly extrapolated over a typical work week). Data for 6<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> grade Palestinian workers indicate similar patterns. In comparison with data from the National Longitudinal Study of Adolescent Health (Add Health) in 1996 which indicated that less than 8% of 10<sup>th</sup> graders, 20% of 11<sup>th</sup> graders and 46% of 12<sup>th</sup> graders worked more than 19 hours per week during the school year (Institute of Medicine, 1998). Other studies also report similar findings (Bachman & Schulenberg, 1992; Light, 1995; Resnick, 1997; Schoenhals, 1997) including an Indian study reporting that half of



working children are employed for less than five hours daily (Nivethida & Roy, 2005). Discrepancies between these estimates are obvious and may reflect different reference periods and interview protocols, self vs. proxy response, survey design (personal visit vs. telephone survey administration, etc.), respondent bias, errors in recall, and other measurement and methodological issues. While estimates of the prevalence and intensity of work vary considerably across samples, this study clearly indicates that substantial numbers of Palestinian youth combine school and part-time employment.

The high prevalence observed among Palestinian working children may be due to the high overall unemployment rate observed in the (44% West Bank) and (72% in the Gaza strip) populations are below the poverty line (World Bank, 2006). Since the second intifada in September, 2000, and despite child labor law restrictions, increasing numbers of school-aged youth have entered the labor force (PCBS, 2006). Under conditions of economic crisis, youth work may be considered a necessity for families whose income has been severely compromised by geopolitical events. Factors such as reductions in foreign aid, factory closures, corruption in the newly governing Palestinian Authority, and Israel's generalized border closures and blockades have seriously damaged the economy of these territories (Development Studies Programme, 2004). One possible explanation is the high density of the refugee population along the Gaza Strip and an increased fertility rate of 4.5 children per woman in Gaza and the West Bank resulting in a high percentage of children under the age of 15 (42.5%) (PCBS, 2009).

### ***Work Intensity and Injury***

This study found that out of those who reported working, 79.1% (boys 81.7% vs girls 73.0%) suffered from occupational injuries. This prevalence of injuries was higher when compared with Lithuanian school adolescents (59% among boys and 40% among girls) (Starkuniviene et al., 2005) and Nigerian school children (64.5%) (Fetuga et al., 2005). In the U.S. in 2003, a national telephone survey among teens employed in the retail/service industry estimated that 69% of 16-17 year-olds were involved in any kind of work (75% of males, 62% of females) (Runyan et al., 2000; Runyan et al., 2007).

Our findings from this study indicate that youth employed more than three hours daily (high intensity workers) were approximately 1.3 times more likely to experience an occupational injury than students working fewer than three hours a day. Several studies have revealed that extensive employment during the school year may have deleterious consequences on young workers (Bowling, 1996; Dunn, 1998; Parker, 1994b). This may be explained by the fact that children working fewer hours weekly have less exposure to injury risks. A similar dose/response effect was found among South Texas students (Weller, 2003; Weller, 2004). In this study, middle and high school students working more than 20 hours weekly were 1.8 and 1.5 times, respectively, more likely to be injured than students working 10 or fewer hours weekly. Methodological issues (daily vs. weekly work) prevent more direct comparisons of the two studies (Weller, 2003; Weller, 2004); however, working more hours during the school year raises health and safety concerns about working students.

### ***Work Settings and work Injuries***

We found that most of the schoolchildren work was of an informal nature in the retail trades, agriculture, and clerical/cleaning positions. By comparison, in the U.S. slightly more than half of 15-17 year-olds are employed in the retail sector (restaurants, grocery stores). Another one-quarter work in the service industry while slightly more than one-fifth work in agriculture, manufacturing construction, and other trades (U.S. Department of Labor, Bureau of Labor Statistics, 1997; Steinberg & Cauffman, 1995).

In a study of working children in Nigeria, almost half reported street trading while one-quarter worked in retail and another one-quarter in farming (Fetuga et al., 2005). Most children, however, work in agriculture and industry. In 1992 in Pakistan, more than two-thirds of the estimated 1.5 million employed in the carpet industry were children (UNICEF, 1992). Indonesian domestic service employs an estimated 5 million children each year (International Labour Conference, 1998). In India, where most working girls are employed as domestics, children are also employed either in shops, workshops or in companies (Nivethida & Roy, 2005).

The present study indicates that Palestinian schoolchildren are more frequently injured while working in retail trades, such as grocery stores, food establishments, street vending

(around one half of all injuries), agriculture (about one-fifth of the total injuries) and in service positions, such as house cleaning and clerical work (11.4%). In the U.S., also, retail trades produce about half of all injuries to working youth followed by service jobs (one-fifth of the total injuries), and agriculture and manufacturing (11%) (Layne, 1994). Not surprisingly, most injuries occur in those jobs employing the greatest number of working youth, in this case, the retail sector. However, in Brazil, jobs with the greatest risk for injury include domestic work, waiting tables, and brick making and tile work (Fischer, 2003).

### ***Gender, work intensity and work injuries***

Greater numbers of Palestinian boys reported working compared to girls and with more hours daily. These results are not surprising and are supported by the findings of several nationally-representative studies conducted in the U.S.; across the board, these investigations note differences in the prevalence and intensity of work by gender (Bachman & Schulenberg, 1992; Light, 1995; Schoenhals, 1997). Only one national study in the U.S. in recent years has determined that more females than males work, overall, and that females work more hours weekly than males (Sweet, no date).

Among Indian child Laborers, girls began working one-two years before boys. By the age of 15, however, more boys than girls were working and about one-quarter of the boys in this Indian study worked for more than 10 hours daily (Nivethida & Roy, 2005).

Boys appear to be more likely to sustain an injury at work than girls. This study found that Palestinian boys were 1.6 times more likely to be injured than girls. Numerous other investigations of youth work also find an injury rate for boys that are about twice that of girls (Runyan et al., 2000; Dunn, 1998; Cooper, 1999; Cooper, 1995). In the South Texas study, middle and high school boys were 50 percent more likely to be injured than girls (Weller, 2003; Weller, 2004). These findings could partly be explained by the disparity in weekly work hours between the genders and the greater proportion of working males. Different types of jobs worked by Palestinian boys and girls could also be responsible for this difference. For example; Palestinian boys were working in occupations that are known to be hazardous for workers of any age like manual labor, such as; agriculture,

construction, movement of goods, and street trade while girls worked in retail stores, service positions, such as; cleaning, and in clerical jobs (Runyan, 2000). The Institute of Medicine report of 1998 indicates that U.S. boys are more likely to work in manual Labor than girls who are more likely to work in service positions (U.S. Department of Labor, Bureau of Labor Statistics, 1997; Steinberg & Cauffman, 1995; Institute of Medicine, 1998). These investigations note that adolescent males frequently work in riskier work situations with greater exposure to work-related hazards than females.

### ***Grade and Work Injury***

The present study indicated that younger children (6<sup>th</sup> graders) were more likely to experience a work injury than older ones (8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> graders). Although the U.S. national studies and those at the state level showed similar patterns of injury by age, older US children sustained more injuries (85% of all nonfatal work-related injury occurs in 16-17 year-olds) than younger (Layne, 1994; Cooper, 1995; Brooks & Davis, 1996). Differences in child labor laws, exposure to hazardous situations, levels of responsibility, and work intensity levels in the two areas may be partially responsible for these variations.

Type of work, however, does not appear to explain this discrepancy as about half of all workers in this study, regardless of grade or age, worked in retail, the category of work least likely to result in a work injury. Another fifth of all workers, again regardless of grade/age, were employed in agriculture, a type of work that frequently produces injuries in workers of any age. We may only theorize that their lack of experience, premature cognitive and developmental systems, undeveloped judgment, more immature psychosocial and emotional development, and the pressure of balancing the demands of school and work could play a role in the incidence of work-related injury in these younger youth (Evensen, 2000; Frone, 1998). Studies of adult workers find that inexperience on the job contributes to occupational injuries (Mueller, 1987). It is plausible, then, that the inexperience of preadolescents and early adolescents turns out to be an important factor contributing to increased injury in these youth. These characteristics of preteens, not coincidentally, constitute the rationale behind child labor

laws in many nations that prohibit formal employment in preadolescents until an enhanced age and level of maturity has been attained (Institute of Medicine, 1998).

### ***Types of Injuries***

Among Palestinian adolescents, common reported injuries were strains and sprains (about one-half of all injuries), cuts/bruises/lacerations and fractures, which make up about one-fifth of all injuries, and eyes injuries and poisoning which comprise small percentages of the total injury amount. Similar patterns are seen among U.S. youth where the most common nonfatal injuries in order of decreasing prevalence are lacerations (about one-third of all injuries), contusions or abrasions (almost one-fifth of the total injuries), sprains and strains (slightly less than one-fifth), and burns and fractures (slightly less than one-fifth) (Layne, 1994). These variations may be accounted for by differences in work characteristics, the work environment, the interaction between work and worker, various types of work, age of working youth, differences in equipment; inadequate job training, health and safety training, and supervision patterns; and inappropriate or illegal job assignments (Tilly, 1996; Knight, 1995).

### **Limitations**

Several cautions should be noted in interpreting study results: 1) data represent workers attending school during April-May, 2006 and do not include the large numbers of Palestinian children who are not enrolled in school; 2) results from this study are based on self-reported data and thus are subjected to accuracy of recall; 3) cut-off points for daily work hours were arbitrarily set and limited to the categories used in this analysis (<3hours/day, >3hours/day).

### **CONCLUSIONS**

This is the first national study in Palestine to examine the prevalence and characteristics of work related injuries among schoolchildren. Our results both replicate and contradict the findings of other studies on the same topic among very different young populations. In view of our findings and those of other studies, we believe that parents, policymakers and professionals involved with schoolchildren should carefully monitor the work

circumstances of this exceedingly vulnerable population. Increased efforts are needed to reduce labor injuries. Working schoolchildren, parents, employers, medical providers, and school personnel should be targeted for education, training, and counseling about health and safety hazards and safeguards as well as workplace rights and responsibilities for working schoolchildren. More qualitative research is needed for in-depth understanding for the main reasons behind the high percentage of adolescents labor in order to find out the appropriate interventions to reduce work related injuries.

## **IMPLICATIONS**

This study has implications for programs and policies designed to reduce the prevalence of occupational injuries among Palestinian schoolchildren. The 79.1% rate of labor injury warrants interventions to improve child safety and well-being. It is important to educate adults about the risks of work related injuries and to change their point of views about the remunerations of work among children (Casa, 2003; Salazar, 1990). Since health promotion and prevention efforts may reduce, but not eliminate child labor, it is also important schools and community agencies introduce safety training and skill-building programs for young workers. In addition to these more immediate interventions, governments and community stakeholders should make efforts to combat the causes of inappropriate child labor. With a combination of multilevel policies and culturally-sensitive interventions, Palestine can reduce child labor and related injuries.

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**Table 1.** Socio-demographic characteristics of adolescents according to work status and related injuries in the Palestinian HBSC-2006 study

Sociodemographic Characteristics	Low Intensity (<3 h/d)		High Intensity (>3 h/d)		Work Shift										Work related injuries	
					During school hours		Before school hours		After school hours		On the weekend		End of school semester/ academic year			
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Gender																
Boys	42.6	1439	*57.4	1941	16.7	514	13.7	420	*26.8	823	21.4	658	*21.3	654	*81.7	2760
Girls	*58.3	807	41.7	578	*20.8	240	*16.0	185	22.7	262	*26.2	303	14.3	165	73.0	1011
Grade																
6 Grade	48.1	650	51.9	702	*23.1	274	15.7	186	27.8	330	20.3	241	13.1	155	*82.6	1117
8 Grade	48.0	609	52.0	661	18.5	207	*16.6	185	22.1	247	*24.5	274	18.3	204	76.9	976
10 Grade	44.5	510	55.5	635	11.9	121	11.7	119	*28.8	294	23.5	240	*24.2	247	76.3	874
12 Grade	47.8	477	52.2	521	16.9	152	12.8	115	23.8	214	22.9	206	23.7	213	80.6	804
School Ownership																
Gov.	*47.7	1843	52.3	2019	17.7	607	*14.8	507	26.0	890	22.1	756	19.3	661	79.5	3071
UNRWA	46.2	279	53.8	325	*20.0	108	14.2	77	*28.3	153	22.7	123	14.8	80	*82.3	497
Private	41.5	124	*58.5	175	14.9	39	8.0	21	16.0	42	*31.3	82	*29.8	78	67.9	203
Region																
West bank	*49.1	1295	50.9	1345	17.2	399	12.4	289	25.4	590	*23.1	536	*21.9	509	77.1	2036
Gaza Strip	44.8	951	*55.2	1174	*18.7	355	*16.6	316	*26.0	495	22.4	425	16.3	310	*81.6	1735
FAS																
FAS 1 (low)	*50.1	1421	49.9	1417	*18.4	465	14.6	369	25.8	653	22.2	562	18.9	478	79.0	2243
FAS 2 (Moderate)	43.0	482	57.0	639	16.2	163	*14.9	150	*26.4	265	22.6	227	19.8	199	80.6	904
FAS 3 (High)	39.8	208	*60.2	315	14.7	68	9.7	45	24.6	114	*26.7	124	*24.4	113	78.6	411

<b>Father's education</b>																
Low education	<b>47.2</b>	1594	<b>52.8</b>	1784	<b>18.3</b>	553	<b>13.6</b>	410	<b>26.0</b>	785	<b>22.9</b>	691	<b>19.2</b>	581	<b>79.5</b>	2686
High Education	<b>45.5</b>	522	<b>54.5</b>	626	<b>16.3</b>	165	<b>15.1</b>	153	<b>25.8</b>	261	<b>23.3</b>	236	<b>19.4</b>	196	<b>80.0</b>	918
<b>Mother's education</b>																
Low education	<b>47.4</b>	1457	<b>52.6</b>	1614	<b>*19.1</b>	522	<b>*15.0</b>	410	<b>25.3</b>	690	<b>21.9</b>	597	<b>18.7</b>	509	<b>79.1</b>	2429
High Education	<b>45.7</b>	689	<b>54.3</b>	819	<b>14.9</b>	201	<b>12.5</b>	169	<b>*27.2</b>	367	<b>*24.4</b>	329	<b>*20.9</b>	282	<b>80.5</b>	1214

n= Sample size; *P*- value of chi-square test .

\*Significant at *P*<0.05.

**Table 2.** Socio-demographic characteristics of adolescents according to type of work in the Palestinian HBSC-2006 study

		Gender		Grade				School Ownership			Region		FAS		
Type of work		Boys	Girls	6 G	8 G	10 G	12 G	Gov.	UNRWA	Private	West Bank	Gaza Strip	FAS 1 (low)	FAS 2 (Moderate)	FAS 3 (High)
Agricultural production	%	*22.9	14.2	*21.0	17.8	19.9	*21.0	*20.5	15.7	19.8	*21.0	18.3	18.1	21.2	*23.3
	n	966	317	365	307	321	290	1076	129	78	781	502	714	317	163
Retail trade	%	46.0	*61.5	49.3	52.7	*53.7	50.1	51.3	*54.4	47.3	48.9	*54.9	*53.8	49.1	47.9
	n	1948	1377	857	908	868	69.2	2691	448	186	1818	1507	2120	732	336
Street traders	%	*7.3	5.7	7.1	*8.9	5.0	5.7	6.8	*7.2	5.6	6.7	6.9	6.4	*6.8	6.4
	n	307	128	123	153	81	78	354	59	22	247	188	254	102	45
Tool maintenance work	%	*4.3	2.0	*4.1	3.3	2.9	3.8	3.5	*3.8	*3.8	3.4	*3.6	3.0	*4.6	3.3
	n	182	45	72	56	47	52	181	31	15	127	100	119	69	23
Cleaners	%	*3.3	2.9	*4.8	3.2	2.2	2.2	2.9	*5.0	3.3	2.9	*3.6	2.7	*4.0	2.7
	n	138	66	84	55	35	30	150	41	13	106	98	107	59	19
Movement of goods	%	*3.7	1.2	2.9	2.4	*3.7	2.4	2.8	2.7	*4.3	2.7	*3.0	2.8	*3.4	2.7
	n	158	27	51	41	60	33	146	22	17	102	83	111	50	19
Building construction/maintenance	%	*3.4	1.0	2.1	2.0	*3.3	3.0	2.4	2.3	*5.1	*3.1	1.9	2.3	2.7	*3.6
	n	145	22	36	35	54	42	128	19	20	116	51	91	41	25
Workshops like carpenting mechanics, aluminum	%	*2.0	0.7	1.0	*1.9	1.5	*1.9	1.5	1.2	*3.3	*1.9	1.1	1.4	*1.7	*1.7
	n	84	16	17	32	25	26	77	10	13	70	30	55	25	12
House work	%	6.9	*10.8	7.8	7.8	7.7	*9.9	*8.4	7.8	7.4	*9.3	6.7	*9.3	6.5	7.7
	n	290	242	135	135	125	137	439	64	29	347	185	367	97	54

n= Sample size; P- value of chi-square test.

\*Significant at  $P < 0.05$ .



**Table 3.** Type of work according to type of injury in the Palestinian HBSC-2006 study

	Type of injury													
	Back pain		Muscle pain		Injuries, deep scratches, or wounds		Bone Fractures		Eye injuries		Exposure to poisonous or burn-causing materials		Other, specify	
Type of work	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Agricultural production	423	*33.0	178	13.9	137	10.7	92	7.2	66	5.1	30	2.3	117	9.1
Retail trade	814	24.5	398	12.0	317	9.5	213	6.4	141	4.2	69	2.1	472	14.2
Street traders	72	17.7	49	11.3	35	8.0	21	4.8	22	5.1	5	1.1	66	15.2
Tool maintenance work	45	19.8	30	13.2	47	*20.7	29	12.8	21	9.3	6	2.6	13	5.7
Cleaners	43	21.1	28	13.7	27	13.2	33	*16.2	27	*13.2	8	3.9	19	9.3
Movement of goods	47	25.4	33	17.8	25	13.5	18	9.7	14	7.6	7	3.8	20	10.8
Building construction/maintenance	42	25.1	33	*19.8	14	8.4	15	9.0	10	6.0	4	2.4	20	12.0
Workshops like carpenting mechanics, aluminum	19	19.0	15	15.0	20	20.0	10	10.0	8	8.0	5	*5.0	7	7.0
House work	158	29.7	59	11.1	34	6.4	29	5.5	11	2.1	10	1.9	97	*18.2

n= Sample size; *P*- value of chi-square test.

\*Significant at  $P<0.05$ .

**Table 4.** Crude and adjusted<sup>‡</sup> odds ratios (95% confidence intervals) for the association of work related injuries with work intensity, work swift, type of work and socio-demographic characteristics in the Palestinian HBSC-2006 study

	Crude OR	95%CI	Adjusted OR	95%CI
<b>Work intensity</b>				
<3h/d	1		1	
≥3 h/d	1.73*	1.53-1.95	1.30*	1.11-1.54
<b>Work shift</b>				
End of school semester/ academic year	1		1	
During school hours	2.48*	1.93-3.18	2.38*	1.80-3.12
Before school hours	2.34*	1.77-3.09	2.20*	1.63-3.01
After school hours	1.76*	1.43-2.16	1.55*	1.30-1.94
On the weekend	1.52*	1.25-1.85	1.55*	1.31- 1.90
<b>Type of work</b>				
Agricultural production	1		1	
Retail trade	1.61*	1.37-1.89	1.61*	1.35-1.92
Street traders	2.53*	1.98-3.21	2.56*	1.96-3.34
Tool maintenance work	0.82	0.56-1.20	0.77	0.49-1.19
Cleaners	0.44*	0.27- 0.73	0.48*	0.28-0.83
Movement of goods	0.55*	0.34- 0.89	0.69	0.42-1.12
Building construction/maintenance	0.91	0.59-1.39	1.01	0.64-1.59
Workshops like carpenting mechanics, aluminum	0.83	0.47-1.44	0.95*	0.53-1.71
House work	1.46*	1.15-1.86	1.39*	1.07-1.80
<b>Gender</b>				
Girls	1		1 <sup>1</sup>	
Boys	1.87*	1.66-2.10	1.56*	1.32-1.84
<b>Grade</b>				
6 Grade	1		1 <sup>2</sup>	
8 Grade	0.65*	0.55-0.76	0.52*	0.41-0.65
10 Grade	0.62*	0.53-0.73	0.48*	0.38-0.60
12 Grade	0.79*	0.66-0.94	0.58*	0.46-0.74
<b>FAS</b>				
FAS 1 (low)	1		1 <sup>3</sup>	
FAS 2 (Moderate)	0.86*	0.79-0.93	0.93	0.85-1.02
FAS 3 (High)	0.85*	0.75- 0.95	0.94	0.82-1.06
<b>Region</b>				
West-Bank	1		1 <sup>4</sup>	
Gaza Strip	1.22*	1.08-1.37	1.15	0.99-1.35
<b>Father's education</b>				
Low education	1		1 <sup>5</sup>	
High Education	0.97	0.89-1.06	1.02	0.92-1.12
<b>Mother's education</b>				
Low education	1		1 <sup>5</sup>	
High Education	0.98	0.82-1.18	0.95	0.80-1.10

CI (Confidence Intervals), OR (odds ratio), FAS (Family Affluent Scale).

\*  $P < 0.05$ .

<sup>‡</sup>Adjusted for gender, grade, region, parent education, FAS. <sup>1</sup> Adjusted for grade, region, parent education. <sup>2</sup> Adjusted for gender, region, parent education, FAS. <sup>3</sup> Adjusted for gender, grade, region, parent education. <sup>4</sup> Adjusted for gender, grade, parent education, FAS. <sup>5</sup> Adjusted for gender, grade, region, FAS.

# CHAPTER 5

## 5.1 Discussion

Children's health is a product of complex interactions between the children's family, social environment, physical settings, genes and behaviour. Since children grow up fast, their response to these influences change and these interactions play an important role in shaping and determining their health.

Results of the present thesis showed that most of the adults were significantly more obese than children for both sexes in Europe and Asia. It also found that Palestinian students in Jerusalem suffered from overweight and obesity (34.2%) while others (4.8%) were underweight. Almost one quarter of the children suffered from anemia (23.3%). Analysis from the HBSC 2006 survey also revealed that almost half of the Palestinian children were involved in injury with boys (53.5%) significantly higher than girls (42.1%). In addition, it showed that 73.8% of the students reported being engaged in labor from which 79.1% sustained a work related injury.

As seen, obesity and injury are major health burdens in Palestine. Recently, possible relationships between obesity and injury have been reported. The nature and extent of these relationships are not quite clear.

Since Obesity and injuries has been discussed thoroughly in the published articles, this part of the thesis will discuss the strengths and limitations of these articles; also it will include an overview of the existing literature to examine obesity–injury relationships.

## **5.2 Strengths and Limitations**

### ***5.2.a Theme one: Nutrition and Obesity***

The first article from this theme covered obesity in 17 countries located in three continents around the Mediterranean Sea; the data were collected from 102 articles (172 data sets), which is statistically enough to draw conclusions about the prevalence of obesity in this region. It was quite difficult to make the comparison of obesity across several age groups because of the fact that these studies used different population age structures (Saw 1997). In order to overcome this problem, age was stratified into two main groups: <18 years and >18 years. To ensure validity and reliability of the results and to avoid the probability of systematic bias, local reports were excluded.

The second article of this theme aimed at giving information about the nutritional status of school adolescents from East Jerusalem with special emphasis to nutrients. The high participation of adolescents to the questionnaire interview indicated well awareness about nutrition related health problems in this critical age period and good intentions to participate in this study that is the first attempt to highlight the nutritional status of adolescents. This study includes a small group of adolescents from East Jerusalem and is by no means representative of the entire Palestinian population. Since the Israeli Municipality schools were not allowed by their management to participate in the survey, it can be assumed that the participation of enrolled students from Israeli Municipality schools could affect the results. The study reflects the inter individual variation for most studied parameters which are observed by high standard deviations, while it does not reflect the intra participant variability which could be achieved by applying multiple 24-h recall.

### ***5.2.b Theme two: Unintentional Injuries***

This is the first study to investigate unintentional injuries and to examine the prevalence and characteristics of work related injuries among schoolchildren in Palestine. It looked at a large population of school-aged children and is considered to be the baseline for future studies. The HBSC questionnaire items were developed continuously over several years and are supported by validation efforts (Currie et al. 2001; Currie1998). The ability to examine relations between different social measures and a variety of injury types is an additional strength. Despite the strengths, this research study was a cross-sectional study, which is not strong enough to draw any causal inferences. As well, it was a self-reported school-based survey that suffers from several methodological limitations mainly: (1) recall bias, (2) “soft” measures of injury, and (3) lack of detailed etiology (Harel et al. 1994). As a comprehensive survey, the HBSC includes a breadth of topics related to the health and well-being of schoolchildren. As such, in-depth information on the exact circumstances (such as burns and poisoning) leading to individual injury events cannot be obtained. Therefore, the depth of the analyses, in terms of the etiological circumstances, is quite limited. As well, the data collected for this study represent workers attending school during April-May, 2006 and do not include the large numbers of Palestinian children who are not enrolled in school. Finally, cut-off points for daily work hours were arbitrarily set and limited to the categories used in this analysis (<3hours/day, >3hours/day).

### **5.3 Why look at injury and obesity?**

Two of the most prevalent problems facing youth in the world are obesity and injury. Obesity may result in higher rates of injury and/or worse outcomes of injury in the population. Over the years, numerous research studies have investigated the link between BMI levels and the relative risk of mortality in association with cardiovascular and metabolic diseases or other chronic diseases. Their results showed a rising relative risk as BMI increases from the normal range to the overweight category (25 to 29.9 kg/m<sup>2</sup>) to the obese category (> 30 kg/m<sup>2</sup>) (Adams et al. 2006; Bogers et al. 2007; Whitlock et al. 2009).

The few first studies on the relationship between obesity and injury tended to focus on obesity as a factor complicating severe trauma (Boulanger et al. 1992; Choban et al. 1991), influencing a safety-related behaviour (Lichtenstein et al. 1989) or as a risk factor for the occurrence of injury in a particular setting, such as sport (Van Mechelen et al. 1996). Among children, studies have showed that obese children are at increased risk of injury and greater morbidity (Brown et al. 2006a; Leet et al. 2005; Timm et al. 2005).

In 1997, a cross sectional study in Rome among 6 to 11 year old school totaling 938 children showed that obese children were significantly more prone to dental trauma than non-obese children (Petti et al. 1997), a finding consistent with that of other researchers (Granville-Garcia et al. 2006; Nicolau et al. 2001; Soriano et al. 2007). Another cross-sectional study in Belgium that studied a representative sample of 2,363 children aged 9 to 17 revealed that obesity increased the incidence of injuries requiring treatment in children, although there was no association between obesity and injuries that required hospitalization (Bazelmans et al. 2004).

A retrospective review in a pediatric hospital in USA, found that obese children had an increased incidence of extremity fractures requiring surgical intervention and a lower incidence of head and abdominal injuries (BMI > 95<sup>th</sup> percentile) (Rana et al. 2009).

Another study found that overweight and obese children with acute ankle injuries were more likely than others to report persistent symptoms of pain, weakness and recurrent ankle injury up to 6 months after an acute ankle sprain (Timm et al. 2005). These results were further confirmed in the results of a case-control study among 180 children aged 13-14, showing significant association between overweight children and presence of ankle injuries (Zonfrillo et al. 2008).

The different conditions in which injuries occur tend to be related with the occurrence of diverse types and severities of injury. Researchers have found different injury patterns in obese patients compared with non-obese patients (Boulanger et al. 1992; Maheshwari et al. 2009; Tagliaferri et al. 2009). Studies have shown that obese youth are at risk for specific injuries such as upper and lower extremity fractures, and musculoskeletal injuries to the ankle (Goulding 2007; Wearing et al. 2006a; Zonfrillo et al. 2008). In agreement with the results of another study which found more severe ankle fractures among obese patients who slipped, tripped or fell on the same level than non-obese patients (Spaine & Bollen 1996).

Similarly, another 3-year retrospective review of a US paediatric emergency department admissions showed that obese children were significantly less likely to sustain head and facial injuries than their counterparts but more likely to have thoracic and lower limb injuries. Remarkably, dynamic obese children suffering from lower limb injuries were more likely to sustain sprains than fractures. The researchers suggested that the factors leading to lower limb injuries are the same factors which may have led to greater bone density and therefore became a protective shield against fractures (Pomerantz et al. 2010). Other studies contradicted by showing no difference in injury severity or injury pattern between obese and non-obese patients (Byrnes et al. 2005; Ciesla et al. 2006). Furthermore, obesity has been linked with increased mortality and morbidity following traumatic injury (Arbabi et al. 2003; Byrnes et al. 2005; Choban et al. 1991; Neville et al. 2004; O'Brien et al. 2006; Sifri et al. 2008).

A 12-month study of blunt trauma patients admitted to a surgical intensive care unit (ICU), found that obese patients with a BMI > 30 were more than 5 times more likely to die from their injury than non-obese patients (Neville et al. 2004). Another study found obese patients with BMI > 35 to nearly 3 times more likely to die after being injured than patients with a BMI < 35 (Byrnes et al. 2005). A 10-year review study of data from the National Burns Registry in the United States found that obese adults were more than twice as likely to die as non-obese patients (Thombs 2008). Studies have also shown that obese patients have a higher prevalence of cardiac, respiratory and metabolic comorbidities that can impair their response to injury and result in post-injury complications (O'Brien et al. 2006; Sifri et al. 2008). Also, obese patients are more likely to require more medical resources as admitted patients and outpatients (Bertakis & Azari 2005). Unfortunately, no studies were found to discuss mortality and morbidity among injured obese children.

Many research studies on adults show that regardless of the injury mechanism, obesity has effects on the progression of the injury condition. One study showed that being overweight or obese increased the risk of pneumonia, sepsis and renal failure among trauma patients by 2 to 4 times when compared with normal-weight patients (Haricharan et al. 2009). These results are consistent with another study which shows higher rates of post-injury pneumonia, sepsis, renal failure, and multiple organ dysfunctions previously reported in obese trauma patients (Brown et al. 2005). No studies related to the progression of injuries among obese children were found.

Several injuries are sustained at the work place. Over the years, worker's obesity has been considered a possible risk factor to work-related injuries. No studies have concentrated on the role of obesity in these injuries among children. A couple of studies in 2007 showed that obesity among adults increases the risk of certain work-related injuries such as musculoskeletal disorders, heat stress, transportation accidents and



vibration- induced injury among adults (Pollack & Cheskin 2007; Schulte et al. 2007) and that traumatic workplace injuries increase with increasing BMI (Froom et al. 1996). Other common work related injuries among obese adults are lower back pains (Fransen et al. 2002; Ostbye et al. 2007), lower extremities (Lievense et al. 2002; Manek et al. 2003), wrists (Geoghegan et al. 2004) and shoulder (Miranda et al. 2001). Repetitive movements by obese workers such as kneeling, squatting and typing, composite increase the risk of injuries such as carpal tunnel syndrome or osteoarthritis (Coggon et al. 2000).

# CHAPTER 6

## 6.1 Conclusion

Reducing the burden of childhood diseases has frequently been asserted by international and national statements and policy. Unfortunately, high levels of childhood mortality, morbidity and disability still continue worldwide. As seen in this study, part of the reason for these problems, is the impact of childhood obesity and injuries affecting children of all ages.

In Palestine, the extent, risk factors and preventability of child obesity and injuries are not extensively appreciated at all levels, from policy makers and donors to the local community. This absence of understanding means that resources for the prevention of these problems are not correctly allocated.

It is useful to recall the recommendations reiterate with the recommendations of the WHO Guidelines for Obesity control (WHO, 2012) and the World Report on Injuries (WHO accessed August 2013).

### ***WHO recommendations on Obesity:***

1. To develop and implement a public health strategy that deals with obesity.
2. To promote policies and action plans at all levels to address diet and physical activity behaviours.
3. To build community capacity to promote physical activity and healthy eating.
4. Develop a preventative intervention to reduce the risk factors which result from unhealthy diet and physical inactivity.
5. To increase recognition and awareness of the implications of unhealthy diet and inadequate physical activity levels and knowledge of preventative measures among parents and children.
6. To encourage monitoring, evaluation and further research.

***WHO recommendations on Injuries:***

1. Incorporate child injury into a comprehensive approach to child health and development:
2. Develop and implement a child injury prevention policy
3. Implement specific plans of actions to prevent and control child injuries
4. Strengthen health systems to address child injury
5. Enhance the quality and quantity of data for injury prevention
6. Define priorities for research and support research on the causes, consequences, costs and prevention of child injuries
7. Raise awareness of and target investments towards child injury prevention

The relevance of these two sets of recommendations are confirmed by the findings of the present thesis. In Palestine, a comprehensive strategy for child health and development should include all leading causes of ill health and disability among children. This general strategy should include prevention strategies as part of the basic package of child health services and put emphasis on primary health care. As well, there should be a control policy bringing in a wide range of sectors to include those involved with transport, health, consumer product safety, agriculture, education, and law. There should also be representation across the disciplines, with child development experts, epidemiologists, engineers, urban planners, clinicians, social scientists and others. The policy should take the needs of all children into account, particularly those who are vulnerable, such as poor and homeless children, children with disabilities and female children, and should be linked to other child health strategies.

The health system as a whole should be strengthened to provide high quality care to obese and injured children. It should provide these children with the suitable physical and psychological support. The development of training programmes should be a

priority. To well understand the health system, a good information system to assess the volume of children already suffering from obesity and injuries in addition to children who are at higher risk should be developed. The information systems on child obesity and injuries should be simple and cost effective to implement; appropriate to the levels of skill of the staff using them and consistent with national and international standards.

A research agenda for child obesity and injuries should be developed at the national level. Research in all the main areas related to child obesity and injury should be strengthened to include economic analysis, large-scale intervention trials and how best to integrate injury and obesity interventions into child health programmes. And since it had been proven by different countries that child obesity and injuries are predictable and preventable, it is vital that awareness programmes are created to target the public, policy-makers, medical personnel and donors.

To best implement these recommendations, the following stakeholders should cooperate:

- ***International, development and donor organizations*** should allocate funds to promote research and to develop interventions and evaluations on child obesity and injuries.
- ***The Palestinian Government*** should also allocate national funds for the development of child health. It should identify a specialized agency/department to carry out research on child health in general and obesity and injury prevention in particular. This agency/department should be responsible to develop a plan of action for child obesity and injury prevention. As well as establishing a data bank to include local issues related to children. In addition, it should coordinate activities across the involved sectors. The government should support health behavior awareness campaigns and programs, as well as provide access to health care services for children.

- ***Non-governmental organizations*** should assist the government by identifying the local problems and help in the execution of the government health strategies towards the prevention of obesity and injuries. They ought to support capacity building, undertake pilot prevention programs and sponsor campaigns for healthy lifestyle among children.
- ***The media*** should initiate campaigns to promote healthy attitudes among children and to provide accurate reports documenting the consequences of child obesity and injuries.
- ***Schools and parents*** are responsible to share this information with the children and to educate them about the risk factors of obesity and injuries encouraging them to adopt safe and healthy habits.
- ***Children and young people*** should refrain from engaging in high-risk behaviours and promote healthy attitudes among peers and family.

Since HBSC survey is a population survey which includes the necessary anthropometric measurements and questionnaire, it will be the best tool to study the relationship between the occurrence of injury and the presence of obesity as well as the impact of physical activity on both variables. While physical activity has health benefits, it is reasonable to ask whether the evidence on which such advice is based takes account of injury risk, and whether that differs between obese and non-obese participants. Such a study would provide information on the effect of obesity on requirements for hospital care if serious injury has occurred. As well, it will indicate the circumstances in which injury occurs and the influence of obesity and pattern of injury occurrence. It can also be used as a tool to develop preventive and awareness programs.

The extent, risk factors, and preventability of child obesity and how they relate to injuries are not extensively appreciated in Palestine. Findings from this thesis fill a recognized void in the Palestinian adolescent health literature, in that it provides new information

about their eating habits and risk of injuries. The results of this study are expected to urge the Palestinian government to design awareness and school education programs that encourage healthy dietary habits combined with physical activity. As well as the development of a National Injury Prevention and Intervention Programs aimed at enhancing the safety of Palestinian adolescents.

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