جامعة القدس

كلية الصحة العامة

School of Public Health

القدس – فلسطين

وزارة الصحة

Deanship of Graduate Studies

Al- Quds University

Workload Measurement in Governmental Primary Health Care Medical Laboratories-Gaza Strip

Reem Tawfeek Abu Shomar

MPH Thesis

Jerusalem – Palestine

2007/1428

Declaration:

I certify that all materials presented in this thesis are my own work and has not written to me, in whole or in part, by any other person(s), and that no portion of this thesis has been submitted as an application for another degree or qualification or any other university or institution.

Signed

Reem Tawfeek Abu Shomar.

20-November-2007

Acknowledgements

This has been an incredible and fulfilling journey that was only made possible with the support and guidance of others. I would like to first and foremost thank my **GOD** for giving me the strength and willpower to complete this study. I also would like to thank my supervisor, **Dr. Yehia Abed,** Associated Professor, and Health Consultant, for his support, advice, and constructive criticism throughout the entire process.

A debt of gratitude also is extended to the laboratories & blood banks directorate director, **Dr. Randa El –Khoudari** and the director of primary health care laboratories **Mr. Mohamed Shams** for facilitation and support throughout this study. I also owe a world of thanks and appreciation to **Dr. Bassam Abu Hamad,** Associated Professor, for his encouragement, and valuable comments.

I wish to express my deepest thanks for his Excellency Minister or Environment **Dr. Yousef Abu Safia** for his valuable comments. Also thanks to **Dr. Zakaria AL Astal** the director of Khanunis hospital laboratory for his constructive criticism.

Sincere thanks go to, UNRWA field laboratory service officer **Mr. Omar EL Omwasi** for his help and support. I extend my gratitude to the School of Public Health for making this journey a memorable experience. Special thanks goes to, **Dr. Suzan Shusha'a**, **Mr. Sadi Awwad** and **Mrs. Labiqa El-Wally, Mr. Shaban Mortaja**, and **Miss Suzan Abed**, for their generous kind and assistance. Also I would like to thank **The Canadian Institute of Health Information** CIHI for their valuable MIS CD-ROM.

I would be remiss if I didn't thank **my colleges** at primary health care laboratories and central laboratory, for their help. I also thank all those who provided information, statistics, advice, or a listening ear as I worked to complete this study.

Abstract

Primary health care medical laboratories play a vital role in providing a high quality service to meet needs of the clients, community and health staff. To ensure a high quality of laboratory service it should be well managed. A realistic and accurate assessment of laboratory workload is necessary for effective laboratory management. Workload, the sum of the work achieved or to be achieved, is obtained by multiplying the raw count of each individual procedure by its unit value expressed in units (minutes). For many years, there had been dissatisfaction with the existing method of assessing workload since it doesn't reflect the complexity which varies from test to test.

A cross sectional study about workload measurement was carried out on the governmental primary health care medical laboratories in Gaze Strip to develop workload measurement and once developed, it will serve as a management tool especially for decisions regarding staffing level and distribution. Other objectives of the study were to determine employees' perception about their workload and working environment. The study included all the eighty four employees who had technical responsibilities at the time of the study. Data had been collected using a self-administered employee questionnaire to get information about employees' perception, an observational checklist to get information about staff and working environment, and an extraction sheet to record the observed time for laboratory test performed at the PHC laboratories obtained through the conduction of time study by well trained medical technologists.

The research findings indicate that, PHC laboratories do not have workload measurement standard and that staff distribution is not based on the number of tests performed by each

laboratory. Further more, employees' knowledge about workload measurement tends to be low. In this research, 66% of employees believed that over-workload exists in PHC laboratories and they attribute their feeling of being overloaded to factors such as inadequacy of staff, increasing work intensity, increasing paperwork, frequent equipment failure and absence of clear job descriptions. Regarding staffing decisions, 45% of employees have negative perceptions regarding staffing decisions in the sense of being fair, transparent and objective. Also, about 45% of the employees have a negative perception about their working environment which may be attributed to improper working conditions such as unavailability of sufficient working area in 62.5% of laboratories. In addition, 55% of employees were dissatisfied of the service provided by the maintenance department since 50% of the laboratories have at least one disrupted instrument.

Finally, the research presented the results of unit values per test achieved though the conduction of time studies. An examples were the unit values for Hb, CBC, WBCs, ESR, and Blood grouping & Rh which were 3.5, 2.7, 6.0, 3.3, and 4.1 minutes respectively. Also for Glucose, Urea, Creatinine, Uric Acid, Cholesterol, and Triglyceride, the results for unit values were 6.3, 7.9, 8.1, 6.6, 6.5, and 6.5 minutes respectively.

The researcher recommends utilization of workload unit values determined by the researcher through the conduction of time study to develop workload measurement system in the governmental medical PHC laboratories. More involvement of the staff in decision making and improvement of both working environment and management of instruments are also recommended.

الخلاصة

قياس حجم العمل في مختبراتِ الرعايةِ الأوليةِ الطبيةِ الحكومية

في قطاعِ غزة

تلعبُ مختبراتُ الرعايةِ الأوليةِ الطبيةِ دوراً حيوياً لتوفيرِ خدمةٍ عاليةِ الجودة، تُلبي حاجةَ المرضى والمجتمع و الطاقم الطِبي، لذا كانَ منَ الواجبِ إدارتها بشكلٍ جيد، حيثُ يعتبرُ التقييمُ الدقيقُ لحجمِ العملِ ضرورياً لإدارةِ المختبرِ بفاعلية، فحجمُ العملِ هو ما أُنجز أو ما سَيتمُّ إنجازهُ من العمل، ويُحسب بضربِ العددِ المجردِ للفحوصاتِ المخبرية بقيمةِ وحدتِهِ مُمثَلةً بالدقائق.

ظَهر في السنواتِ الماضيةِ استياءٌ ملموسٌ من الطريقةِ المستخدمةِ لتقييمِ حجمِ العمل، والتي لا تأخذُ بالحُسبان الاختلافَ بين الفحصِ والآخر.

تهدفُ هذه الدراسةُ المقطعيةُ إلى تطويرِ قياسِ حجمِ العملِ في مختبراتِ الرعايةِ الأوليةِ الطبيةِ الحكوميةِ بقطاعِ غزة ، مما سيساعدُ في توفيرِ أداةٍ إداريةٍ، وبخاصةٍ عندَ اتخاذِ قراراتٍ بشأنِ عددِ الموظفينَ وتوزيعِهم.

كما تهدفُ الدراسةُ إلى تحديدِ وجهةِ نظرِ موظفي مختبراتِ الرعايةِ الأوليةِ حولَ حجمِ العملِ و كذلك بيئة العمل.

شَمِلت الدراسةُ جميعَ موظفي الرعايةِ الأوليةِ الطبيةِ الحكومية، وعددُهم أربعٌ وثمانون موظفاً، حيثُ تمَّ جمعُ المعلوماتِ باستخدامِ استبانةٍ يُعبئُها الموظف، ونموذجِ تقييمٍ، بالإضافةِ إلى نموذجٍ لاستخلاصِ نتائجِ الوقتِ اللازمِ لإجراءِ الفحوصاتِ المخبرية.

أَظهرتْ الدراسةُ عدمَ توفرِ معيارٍ خاصٍ لقياسِ حجمِ العملِ في مختبراتِ الرعايةِ الأولية، كما أظهرتْ أنَّ توزيعَ الموظفين لا يعتمدُ على العددِ المجردِ للفحوصات.

أَما بالنسبةِ لمعرفةِ الموظفين لطريقةِ قياسِ حجمِ العمل، فقد كانت منخفضةً. كما يعتقد 66% من الموظفين بأَنَ هُناك زيادةً في حجمِ العملِ داخلَ مختبراتِ الرعايةِ الأولية، ويُرجعونَ هذهِ الزيادةَ إلى أسبابٍ عدةٍ أهمُها: نقصُ الموظفين، وزيادةُ كثافةِ العمل، وزيادةُ العملِ المكتبي، وتعطلُ الأجهزةِ المتكرر، وغيابُ الوصفِ الوظيفي الواضح.

كما بيَّنتْ أن نسبة 45% من الموظفين يَعتبرون القراراتِ الخاصةَ بعددِ الموظفينَ وتوزيعهم غيرَ عادلةٍ أو موضوعية. كما يميلُ 45% من الموظفينَ إلى اعتبارِ بيئةِ عملهمْ غيرَ مناسبة، ويُرجِعُ الباحثُ السببَ لظروفِ العملِ غيرِ المناسبة، كعدمِ توفرِ مساحةٍ كافيةٍ للعملِ في حوالي 62.5% من مختبراتِ الرعايةِ الأولية، كما أظهرتْ الدراسةُ عدمَ رِضا 55% من الموظفين عن الخدمةِ المقدمةِ من دائرةِ الهندسةِ والصيانة، ويُرجِعُ الباحثُ السببَ لوجودِ جهازٍ معطلٍ واحدٍ على الأقلْ في 50% من المختبرات.

وأخيراً قدَّمَ الباحثُ نتائجَ دراسةِ حسابِ الوقتِ اللاز مِ لإجراءِ الفحوصاتِ في صورةِ قيمةٍ (Unit value) لكلِ فحص، فَعلى سبيلِ المثال كانت نتائج متوسط القيم لكلٍ من فحص الهيموغلوبين و CBC وعدد كريات الدم البيضاء وسرعة الترسيب وفصيلة الدم هي على التوالي 3.5 و2.7 و6.0 و3.3 و4.1 دقيقة.

وكذالك بالنسبة لكل من فحص السكر و ال ىولينا والكرياتنين وحمض البوليك و الكوليستيرول و الدهون الثلاثية فقد كانت النتائج على التوالي كما يلي 6.3 و7.9 و8.1 و6.6 و6.5 و6.5 دقيقة.

توصي الدراسة بالاستفادة من القيم (Unit value) التي توصل إليها البحث، وذلك لتطوير نظام قياس حجم العمل في مختبرات الرعاية الأولية الطبية الحكومية، وكذلك إشراك الموظفين عند اتخاذ قرارات بشأن عدد الموظفين و توزيعهم، كما توصي بتوفير بيئة عمل مناسبة، وإدارة للأجهزة بشكل أفضل.

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations

ALT	Alanine Transaminase
ASOT	Anti-Sreptolysin O Titer
AST	Aspartate Transaminase
Blood gp. & Rh	Blood group and Rhesus Factor
CAP	College of American Pathologists
CBC	Complete Blood Count
CIHI	Canadian Institute of Health Information
CRP	C- Reactive Protein
ESR	Erythrocyte Sedimentation Rate
GDP	Gross Domestic Product
GS	Gaza Strip
HB	Haemoglobin
HCT	Hematocrite
MIS	Management Information System
MOH	Ministry of Health
NGOs	Non Governmental Organization
NHS	National Health Service
NIS	New Israeli Sheqal
PCBS	Palestinian Central Bureau for Statistics
PHC	Primary Health Care
RF	Rheumatoid Factor
RIA	Radio Immuno-assay
SD	Standard Deviation
SPSS	Statistical Package of Social Science
UNEP	UN Environment Program
UNICEF	United Nation International Children's Emergency Fund
UNRWA	United Nation Relief and Works Agency
UV	Unit Value
WB	West Bank
WBCs	White Blood Cells
WHO	World Health Organization
WISN	Workload Indicators of Staffing Need
WMS	Workload Measurement System

Definitions of Terms

Benchmarking: is a process used in management, in which organizations evaluate various aspects of their processes in relation to best practice (Wikipedia, 2007-a).

Communication: is the transference and understanding of meanings (Robbins, 1998).

Management: is the art of getting things done through people (Holt, 1987). For health care laboratories it is the guiding of human and physical resources (money, equipment, reagents, material and space) through the complex, changing and difficult environment towards determined goals and objectives, achieving beneficial results for those served (Houang and EL-Nageh, 1993). Management can also refer to the person or people who perform the act(s) of management (Wikipedia, 2007-b).

Medical Laboratory: an area where tests are done on biological specimens in order to get information about the health of the patient (Wikipedia, 2007-c).

Perception: is a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment (Robbins, 1998).

Primary health care: essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community

and the country can afford to maintain at every stage of their development in the spirit of self-determination (Declaration of Almata, 1978).

Unit value per procedure is the mean number of units involved in performing all activities required to complete the defined procedure once (Houang & EL-Nageh, 1993).

Workload measurement system: is a tool for measuring the volume of activity provided by a specific functional centre in terms of a standard unit of time (Canada, CIHI, 2006).

Workload unit: minute of productive technical, clerical and aid time (Houang & EL-Nageh, 1993).

Workload: is the sum of the work achieved or to be achieved, obtained by multiplying the raw count of each individual procedure by its unit value expressed in units (minutes) (Houang & EL-Nehgeh 1993).

Chapter 1

Introduction

1.1 Definitions

Before getting deeply into the literature it is better to clarify some important terms which will be mentioned in the following paragraphs.

Primary Health Care (PHC), was a new approach to health care that came into existence following the international conference, held in Alma Ata in 1978 organized by the World Health Organization (WHO) and the United Nation International Children's Emergency Fund (UNICEF). It was defined as "essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-determination". This term was accepted by the member countries of WHO as the key to achieving the goal of health for all (Declaration of Almata, 1978).

Medical Laboratory is defined as an area where tests are done on biological specimens in order to get information about the health of the patient (Wikipedia, 2007 c). Accordingly PHC medical laboratories are medical laboratories existing in PHC facilities to achieve the goal of PHC.

The mission of governmental medical laboratory services is to provide a sustainable national laboratory system with good laboratory diagnostic practice that will improve the quality of care at all health care levels (Palestine, National Strategic Plan, 1999-2003). The successful achievement of the aforementioned mission and the provision of such services are key elements of an effective and efficient health laboratory service which relies on highly complex management activities. According to Bennett, (1991) measurement of work performed provides information about output and is regarded as essential requirement for effective management in laboratories (Bennett, 1991).

Workload as defined by Houang & EL-Nehgeh (1993) is the sum of the work achieved or to be achieved, obtained by multiplying the raw count of each individual procedure by its unit value expressed in units (minutes). They also added that one should consider a number of points when discussing workload which include, how much work the laboratory does; whether the staffing level is adequate; whether the laboratory needs more equipment and whether the laboratory is working efficiently (Houang & EL-Nehgeh, 1993).

Palestinian PHC medical laboratories express workload by the total number of tests achieved (raw count) (Palestine, MOH, 2006). This doesn't take into account the complexity of tests which varies greatly from test to another. According to Houang & El-Nehgeh, managers should refer to a standard list (schedule of workload unit values) to ensure consistency in recording and reporting. Analysis of these units could be useful for particular purposes, such as assessing the possible benefits of automation and allocating resources among laboratories more rationally.

1.2 Research Problem

Workload measurement indicates that what is being produced and forms a critical part of the total information necessary for planning, budgeting, monitoring, and staffing (Bennett, (1991). Unfortunately, Workload measurement for medical laboratory in Palestine didn't have been studied before. On the other had there had been dissatisfaction with the existing method of assessing laboratory workload which relies on the raw total number of tests and which doesn't take into account complexity, which varies greatly from test to test. And because of all of that this research had been implemented.

1.3 Justification

Providing good quality result is one of the high priorities in the mission statement of Palestinian medical laboratories and to ensure a high quality of laboratory services it should be well managed. Since the laboratory staff could be perceived as the most valuable asset in laboratories, they should be evaluated and distributed effectively as inadequate staffing of medical laboratories may compromise quality, whereas excess staff unnecessarily increases the cost of testing (Valenstein, Souers, & Wilkinson, 2004). A realistic and accurate assessment of laboratory workload is necessary for effective distribution of resources between laboratories and for a good management.

According to MOH annual reports (2006), PHC Laboratory activities are expressed by the total number of tests, which doesn't take into account complexity which varies greatly from test to test. As reported in the Palestinian MOH annual report (2006), the average annual workload in the intermediate laboratories is 16,532 tests per technician, compared to 7,226 tests per technician in the peripheral laboratories. This suggests unfair workload distribution

between intermediate and peripheral laboratories, unfair staffing or inaccurate workload measurement method. For some years there has been dissatisfaction with the existing method of assessing laboratory workload which relies on the raw total number of tests (Director of Laboratory and Blood Banks Directorate "October 2007", Interview).

Accurate information about workload is essential to calculate productivity which is the ratio of outputs to inputs, where the outputs are measured in term of total workload units (Lalonde, 1992) and (Houang & EL-Nehgeh, 1993). Unfortunately there is currently no national database that contains all the accurate and correct types of information needed to properly calculate productivity and make any meaningful analysis.

1.4 Objectives

1.4.1 General Objective:

To develop workload measurement in governmental PHC laboratories in Gaza Strip.

1.4.2 Specific Objectives:

1. To describe the existing workload measurement method at MOH governmental laboratories.
2. To explore the perception of employees in the PHC laboratories about their workload.
3. To explore the perception of employees in the PHC laboratories about their working environment.
4. To determine workload unit values for laboratory tests performed at PHC medical laboratories.

1.5 Background

As mentioned by the Palestinian Ministry of Health (MOH) annual report (2006), MOH laboratory services are offered to the Palestinian people at three levels: central, intermediate, and peripheral. The central laboratory is a referral one specialized with advanced analyses and it receives samples from all governorates in Gaza Strip. The intermediate laboratory is hospital based serving inpatients and outpatients and collaborates with nearby hospitals. The peripheral laboratories are located in the PHC centers. According to the previously mentioned annual report (2006), MOH owns and operates 146 laboratories; 123 peripheral, 19 intermediate and 4 central laboratories. In Gaza governorates, there are 32 primary health care laboratories with an average annual workload of tests per technician 7,022 (Palestine, MOH, 2006).

PHC laboratories are divided into three levels according to the level of clinic they belong to. Those levels are; level two, level three and level four. According to Massroujeh (2003), level two laboratories perform the following tests: Hemoglobin test, Urine and Stool Analysis, E.S.R, and Glucose test. Level three laboratories perform serological tests such as ASOT, RF, CRP, Brucella, and Pregnancy test in addition to the previous tests performed by level two laboratories. Level four laboratories perform all previously mentioned tests in addition to Urea, Creatinine, Uric Acid, Cholesterol, Triglyceride, Bilirubin, Protein, Albumin, Alkaline Phosphatase, AST, and ALT.

1.5.1 Demographical Characteristics of Gaza Strip, Palestine:

Palestine has an important geographical and strategic location; it is situated on the eastern cost of the Mediterranean Sea, bordered by Lebanon on the North, Syria and Jordan on the East, the Gulf of Aqaba on the South and by Egypt and the Mediterranean Sea on the West. Now,

Palestinian National Authority comprises the two geographically separated areas, the West Bank and Gaza Strip. Gaza Strip comprises a narrow zone of land, located South-West of Palestine. It stretches along the Mediterranean Sea 50 kilometers long and 5 to 12 kilometers wide with a surface area about 365 square kilometers and a latitude of 0-40 meters above sea level (Annex 1) (PCBS, 2006, & UNEP, 2003). As mentioned in the Palestinian MOH annual report (2006) Gaza Strip constitutes 6.1% of the total area of the Palestinian Territories with a population density of 3,808 inhabitants per square km.

According to Palestinian Central Bureau of Statistics 2006, the population of the Palestinian Territory is estimated to about 4 million at the end of 2006 thereof 2.5 million (63%) in West Bank and 1.5 million (37%) in Gaza Strip of them 69% are refugees. Gaza Strip comprises the following five governorates: the Northern Governorate constituting 17% of the total area of Gaza Strip, Gaza Governorate constituting 20.3% of the total areas of Gaza Strip, Mid-Zone Governorate constituting about 15% of the total area of Gaza Strip, Khanuonis Governorate constituting about 30.5% of the total area of Gaza Strip and Rafah Governorate constituting about 16.2% of the total area of Gaza Strip.

According to the distribution of the population by governorates, Gaza governorate has the largest population size in Gaza Strip (13% of the total population of the Palestinian Territory) and its population natural increase rate is 3.8% in 2006. According to the most recent estimates, 48.8% of the people in Gaza Strip are under 15 years old, and 2.6% of them are above 65 years. Gender distribution is estimated to be 102.5 males for every 100 females. Life expectancy is 71.4 years for males and 72.5 years for females. The crude birth rate is 33.7/1000 and the crude death rate is 3.1/1000 (PCBS, 2006, and Palestine, MOH, 2006).

1.5.2 Socioeconomic Characteristics:

The Palestinian economy was affected by two main factors during the year 2006. Firstly, the continued deterioration of the social and economic situation due to the Israeli measures in the Palestinian Territories after the eruption of the second Intifada in late September 2000. The second factor is the changes in the policy of the donor community which took place after the legislative elections of January 25th 2006, and the forming of the new government. All those events had a negative effect on the macroeconomic indicators. The total government revenues decreased by 29% from those of the year 2005, and the GDP had declined as well (PCBS, 2006).

In 2002 the health sector was financed by the Palestinian National Authority Ministry of Finance (15%), the population (38%) and donors (48%). Forty seven percent of expenditure was through the MOH, while UNRWA was responsible for 10% of total expenditure, NGOs 25% and the private for profit sector 17%. In 2003, the health sector received a minimum of 20% of the total donors' assistance to the Occupied Palestinian Territory which represents around US$ 240 million. The MOH received 61% (US$ 145 million) of the total fund allocated to the health sector. The total MOH expenditure in 2003 was US$ 97.5 million. The salaries, drugs and medical supplies, and the other operating cost represent respectively 56%, 29% and 15% of MOH total expenditure 2003 (Palestine, MOH & European Commission, 2004).

1.5.3 Palestinian Health Care System:

Over the past years, the Palestinian health care system had been developing in dynamic way to face the instability of the Palestinian situation. The four major providers of health care services in Palestine are: the Palestinian health authority represented by MOH, UNRWA,

NGOs, and the private sector. The PHC is considered as the backbone of the health system. It provides health care to all Palestinian people especially for children and other vulnerable groups through primary and secondary health care services as well as tertiary services. PHC centers try to offer accessible and affordable health services for all Palestinians regardless of the geographical locations. At the end of 2005, there were 654 PHC centers in Palestine, out of those 129 centers were in Gaza. MOH is considered the main provider with 63.6% from the total PHC centers, 56 of these centers are in Gaza Strip. Thirty two of the fifty six PHC centers have medical laboratories in there premises (Palestine, MOH, 2006).

1.5.4 Health Human Resources in Palestine, Gaza Strip:

As stated in the Palestinian MOH annual report, the total number of health manpower who is working in the MOH and in the non-MOH health organizations in 2005 was 20,796, out of them 12,444 who work in MOH (7,693 in Gaza Strip).

In 2005, laboratory personnel were composed of 631 employees (WB: 261/ GS: 370) who offered laboratory services for MOH. Eighty four of them were working at PHC laboratories in Gaza Strip (Palestine, MOH, 2006).

1.5.5 Environmental Status:

Palestinian environment is facing serious threats, such as the alarming population growth, limited land resources, long term isolation as a result of the regional political circumstance and the underdeveloped environmental protection system. This had caused serious deterioration, fast depletion and contamination of our environmental resources which in turn lead to health risks among citizens (Lubbad, 2006).

Handling of both hazardous waste and infectious waste mixed up with municipal solid waste is a critical problem which causes environmental and health risks in the Palestinian Territories (UNEP, 2003).

1.5.6 Quality in Medical Laboratories:

Laboratory quality control directorate was established in 1995. It aims to generate awareness of quality concept among laboratory employees, beside the activity of quality assurance program. The quality program carries the responsibility of instrumentation management which includes measures to select instruments, periodical maintenance and calibration (Abu Shaa'ban, 2007).

1.6 General Review of the Study Chapters

Workload measurement in the governmental primary health care laboratories in Gaza Strip will be addressed in seven chapters starting with an introduction that had been discussed in the previous section. In chapter two, the researcher provided a literature review to address the need for workload measurement and to describe methods of developing workload unit value which is the cornerstone for workload measurement. Chapter three will illustrate factors that affect and are affected by workload and the conceptual framework for laboratory activities that should be taken in consideration while conducting a time study. Through chapter four of this study, the researcher describes the methodological aspects considered when conducting this research, which include: study design, study population, study place, ethical consideration, study instrument, pilot study, data collection, processing and analyzing the data, and limitations of the study. In chapter five, the researcher presents the main study

results based on the results of the statistical analysis, which involves results about employees' perception about their workload and working environment and also the result of workload unit values for tests performed at PHC laboratories. The study results are discussed in chapter six, and finally conclusion and recommendations will be presented in chapter seven.

Chapter 2

Literature Review

The literature from periodicals, studies, published books, and internet sites had been reviewed and the majority illustrates the essentiality of workload measurement. But unfortunately, there has not been a greet deal of research on the subject of assessing employee's perceptions about workload in medical laboratories and their working environment. There had been precious little research regarding this issue in medical laboratories. The most pertinent information used to conduct a time study had been taken from standards for management information system in Canadian Institute of Health Information CD-ROM (2006) and principles of management of health laboratories, by Houang & EL-Nageh (1993).

This chapter is divided into four main parts. It begins with reviewing literature about workload; its definition, measurement through the development of workload unit and its managerial importance. Followed by, reviewing the literature about assessment of employees' perception then the literature about the importance of communication between employees and management and finally the forth part presents literature concerning laboratory working environment.

2.1 Workload

2.1.1 Definitions:

Reviewing literature revealed that the term management is used in several ways according to the situation and background of the person using the term. There are many definitions of management; a frequently used one is the art of getting things done through people (Holt,

1987). However the researcher tends to agree with Houang & El-Nageh that the most suitable definition for health laboratory services may be formulated as the following: management is the guiding of human and physical resources (money, equipment, reagents, material and space) through the complex, changing and difficult environment towards determined goals and objectives, achieving beneficial results for those served (Houang & EL-Nageh, 1993). Also, McClatchey (1994) conceder managing the quality of care, managing capital and cost and managing human resources as the key elements for success in Laboratory management.

As a general definition workload is the amount of work assigned to or expected from a worker in a specified time period (Wiktionary, 2007). In principle of management of health laboratories by Houang & El-Nageh, workload is defined as the sum of the work achieved or to be achieved. According to the Canadian management information system, workload measurement system (WMS) is a tool for measuring the volume of activity provided by a specific functional centre in terms of a standard unit of time (Canada, CIHI, 2006).

2.1.2 History of Workload Measurement:

In the early 1940s, pathology laboratories in the United Kingdom attempt to quantify work performed using a time based workload unit in which one unit equal to 10 minutes of time, consisting of seven minutes technical and three minutes support time (Bennett, 1991). As early as 1954, clinical laboratory services in Canadian hospitals were required to report workload data to statistics Canada (Lalonde, 1991, & Canada, National Hospital Productivity Improvement Program, 1987). This data was based on the previously mentioned unit value system developed in the U.K. In 1965, the Canadian Association of Pathologists received a national health research and development grant from the Department of National Health and

Welfare to produce new units based on average time studies. The revised Canadian system was structured so that the new unit represented one minute of personnel time for technical, clerical and support staff. The first schedule of unit value, using the new units, was published in 1969. In 1983, the national hospital productivity improvement program was given responsibility for the ongoing maintenance of the laboratory WMS, and they initiated a major revision of the unit values in the mid 1980s. In Canada (1990), the Management Information System (MIS) Project and the national hospital productivity improvement program were merged to create the MIS Group. In 1994, the MIS group became one of the four founding organizations of the Canadian Institute for Health Information (CIHI). The CIHI is responsible for the ongoing management of the clinical laboratory (Canada, CIHI, 2006). When talking about workload unit one can't ignore the efforts of College of American Pathologist CAP at 1969 which offered a similar tool known as CAP in 1969 (Heatherley, 2000).

2.1.3 The Need for Workload Measurement:

According to Lalonde, article (1993): Statistics and indicators, managers can develop indicators that may provide insights into their operations, an example of these indicators are workload indicators. Learning to interpret and use these indicators will allow for better evaluation, monitoring and controlling departmental activities. The ongoing monitoring of statistics and indicators may also make it possible for managers to infer trends as they relate to future planning or budgeting (Lalonde, 1993). Barros (1986) tends to agree with Lalonde in that managers should become adroit user of the workload measurement in order to interpret it to administration. A study in five microbiology laboratories showed that analysis of workload units could be useful for particular purposes, such as comparing differences

between laboratories using different techniques for the same investigation and assessing the possible benefits of automation (Cartwright et al 1985).

There was a general feeling shared by the members of the working group in the Royal College of Pathologists that the specimen (or request) as a workload unit cannot reflect the complexity of workload involved in reporting on different kinds of specimen (The Royal College of Pathologists, 2005). This fact had been addressed in principles of management of health laboratories, by Houang & EL-Nageh (1993) as they criticize the method of using crude test number as a measurement for workload method which doesn't take into account complexity which varies greatly from test to test, and subsequently the specific time required performing any test.

Workload is a major factor that should be considered when decisions about staffing are to be made. Staffing decisions are made to guarantee that appropriate staffing patterns exist to ensure patient safety and quality patient care (AACN, 2005). Shipp, (1998) in workload indicators of staffing need (WISN): a manual for implementation prepared for the WHO, expounded on the importance of having a rational method for setting the correct staffing levels in health facilities since population ratios used in earlier decades did no take account of the wide local variations in workload pattern of each facility. According to his manual, WISN depends on setting an activity standard, an activity time for each test that can be converted into the equivalent annual workload which called the standard workload. Applying standard workloads to the reported workload in annual statistical reports will show how many staff in each category is required. Furthermore, he stated that WISN method is simple to operate and use, technically acceptable, realistic and comprehensible (Shipp, 1998). In a study conducted

by Scott to demonstrate variability in workload among different pathology practice settings and to determine practice characteristics that influence staffing levels, the author found that there is a significant variation among the different settings and concluded that the settings of pathology practices carry specific commitments of time that are different and not equally distributed among all practice settings and strongly influence staffing requirements (Scott, 2006).

Labor productivity usually expressed as the ratio of output (total workload units WLUs) to input (total available man-hours). Heatherley, (2000) stated that when workload system is operated and monthly reports are converted into workload units WLUs, information about labor productivity can be easily obtained. Barros, considered improper workload measurement as a barrier to improved productivity and suggested that low productivity can be cured if managers knew how to diagnose their laboratory operation, thus a systematic evaluation can disclose problems that keep productivity down, and knowing what's wrong is a big step toward a solution (Barros, 1988).

On the subject of benchmarking, Heatherley stated that the process of comparing laboratory operations over time with peer groups using statistical tools and benchmarking can provide valuable insights into areas of operation that need improvement. This requires accurate and timely information about laboratory test activity, staffing, and expense. Most commonly, laboratory performance is compared with past performance or with other institutions (Valenstein, Praestgaard, & Lepoff, 2001 & Bonnie, 1993). One study conducted by Valenstein, about staffing benchmarks for clinical laboratories shows that despite standardization of testing methods in the clinical laboratories, there is a wide variation in

staffing level among institutions. This variation suggests opportunities to improve staff productivity in many facilities (Valenstein, Souers, & Wilkinson, 2004).

A survey of National Health Service (NHS) clinical biochemistry consultants revealed that workload from General Practitioners (GPs) rose by an average of 83% between the first quarter of 2000 and the same quarter of 2004. This rate of increase was three times the rate of increase from non-GP sources. This finding was largely attributed to sharp annual rises in four parameters: TSH (17%), cholesterol (47%), HbA1c (18%) and urine microalbumin (103%). It is estimated that the increased GP workload in 2003-2004 for UK clinical biochemistry laboratories will cost £~30M (Beastall, 2004). Another study of six-year trends in productivity of 73 clinical laboratories in USA, found that there was a significant increase in laboratory labor productivity ($P < .001$). Productivity increases were offset by the significant increasing labor expense ($P < .001$), consumable expense ($P = .005$), and blood expense ($P < .001$). As a result, overall expense per test showed no significant change (Valenstein, Praestgaard, & Lepoff, 2001).

2.1.4 Workload Unit Value:

One workload unit is one minute of productive technical, clerical and aid time (Houang & EL-Nageh, 1993). According to the Canadian management information system, workload unit is one minute spent performing service recipient and non-service recipient activities of the functional centre. Service recipient activities involve specimen collection, specimen testing, and technical support functions while non-service recipient activities involve activities such as teaching and research (Canada, CIHI, 2006). Unit value per procedure is the mean

number of units involved in performing all activities required to complete the defined procedure once. It includes the time required for: initial handling of the specimen, all steps involved in specimen testing, recording and reporting, reagent preparation, maintenance and repair, sterilization and technical supervision (Houang & EL-Nageh, 1993).

2.1.4.1 Unit Value Determination - Time Study:

Several techniques exist to perform time studies; one of them is the observation using a stopwatch (Lalonde, 1991). Houang & EL-Nageh described the process of conducting a time study for each procedure. They recommended the conduction of this study in different laboratories with different technologists using a stopwatch for timing each test procedure (Houang & EL-Nageh, 1993). According to recommendations of the Canadian institute for health information management information system, this task should be the responsibility of a staff, knowledgeable in the activity (CIHI, 2007). Kosinski and Klevinski (1990) said that "for any organization which does not use published standard time frames, they will have to conduct time studies to arrive at the value of each activity".

Reviewing literature regarding others' experience in developing unit value reveals that there are many appreciated efforts as that of the Canadian management information system and the experience of College of American Pathologist (CAP). Also, it is the experience of some countries in the eastern Mediterranean region which had been published by World Health Organization (Houang & EL-Nageh, 1993). And locally, it is the experience of UNRWA laboratories in Gaza Strip in development of workload measurement system. Their estimated unit values are presented in (Annex 2) (UNRWA, 2006-a&b).

2.2 Employees' Perception

Perception was defined by Robbins (1998) as a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment. He believed that managers should be interested in their employees' perceptions because they give warnings of potential problems and because they influence behavior. He commented that perception is important because people's behavior is based on their perception of what reality is, not on reality it self and that satisfied and committed employees have lower rates of turnover and absenteeism. Thus managers want to do those things that will generate positive job attitudes (Robbins, 1998). Akers, pointed out the importance of obtaining feedback from the employees perspective which are pertinent to the overall work performance. He suggested that, it could be used as a management tool to improve work processes, the work environment and morale (Akers, 2002). According to Robbins, job satisfaction is dependent on the individuals' perspective of their job and life, and how the organization provides a climate in which the individual, or group of individuals, are flourishing attitudes (Robbins, 1998). Leadership, management, communication, incentives, working conditions, workload, team or individual work, job and education opportunities play their part in an individual's job satisfaction (WHO, 2003). Inadequate staffing leads also to employees' dissatisfaction, burnout, and turnover (AACN, 2005).

In addition, Barros (1988), recommendes that employees should be assigned duties commensurate with their education, training, and experience accordingly; a highly educated, qualified staff member should not be assigned duties that someone less qualified can perform.

Otherwise, over-qualified employees would become bored, frustrated, and disgruntled. On the other hand, this author focuses on the importance of making explanation for staff members about laboratory performance as this will help employees to understand the organization's goals and why certain decisions are necessary. He added that employee needs must also be considered when decisions are made (Barros, 1988).

One measure of quality of work life is job satisfaction which is considered as an important attitude that can influence behavior (Schermerhorn, 1999). As part of the Total Quality Management (TQM) process, the leadership of Rush Medical Laboratories, with a staff of 400, made an initial commitment to focus on their own employees as the most important customers. Only after the employees' development, their help, their support, and their empowerment could Rush Medical Laboratories make the improvements in customer relationships and obtain the operations improvement, cost savings, and productivity necessary to maintain a competitive edge. Thus employee satisfaction is an integral component of total quality (Gvazdinskas and Maffetone, 1995).

2.3 Communications with Management

Henry (1991) considered inability to maintain an adequate staff as the most prominent indicators of a lack of management and communication skills on the part of clinical laboratory executives. Another indicator was the low morale in the laboratory (Henry, 1991). As stated by Daniel (1996) that partnership between labor and management is essential to develop and implement consensual solutions to challenging problems. Based upon his medical center experience in solving problem especially that one as they decided to discontinue Radio-immunoassays (RIAs) in its nuclear medicine laboratory, he concluded that the positive win-

win results of this partnership in long-term, satisfying resolutions as opposed to the win-lose resolutions that frequently lead to continued conflict and employee dissatisfaction.

Barros stated that, productivity is affected by problems in management style and employee motivation thus managers must take a hard and honest look at their own competence and how it contributes to the efficient operation of the laboratory. For these reasons, regularly scheduled employee meetings are important. But such meetings should serve as a two-way communication vehicle. She added that learning to read warning signs as unusual amounts of tardiness and absenteeism are sure indicators of a motivation problem, as are high rates of accidents, breakage, and spillage (Barros, 1988).

2.4 Laboratory Environment

2.4.1 Laboratory Physical Design:

According to Barros, the physical layout of the laboratory should promote an efficient work flow. Sufficient bench and storage space and enough sinks are essential. She focused on the importance of making laboratory operating under prime conditions and added that working phone intercom system saves time and eliminates yelling for someone to pick up and that unessential paperwork should be avoided (Barros, 1988).

As mentioned in WHO document about safety in health care laboratories, overcrowding, heavy workload, incorrectly installed and poorly-maintained equipment and badly-designed premises are frequent contributing factors to laboratories occupational injuries and illnesses (WHO, 1997).

As a requirement for accreditation by the College of American Pathologists Program, the candidate should be inspected using an observational checklist, the CAP's checklist includes items related to physical facilities. And to ensure compliance with the CAP's accreditation requirements, adequate space with appropriate design should be provided for administrative, clerical functions, and technical work (bench space) (CAP, 2006). According to (Robbins, 1998), work conditions and design variables such as temperature, noise, lighting, work space size, interior layout and arrangement, and degree of privacy can directly influence employee satisfaction. In addition, they indirectly affect employee productivity by influencing communication and employee fatigue.

2.4.2 Instrumentation:

Instrumentation must be adequate for the jobs expected of it, in working order, and simple to operate. There should be no shortages of such basic equipment as microscopes, balances, and centrifuges. Similarly, the inventory of reagents and supplies should cover any unexpected rise in test volume (Barros, 1988).

According to WHO publication about safety in health care laboratories, inadequate knowledge of or training in the use of the apparatus is one of the common factors in equipment related accidents. Accordingly, training is one of proposed activities which are essential in equipment management (WHO, 1997). New employees should be adequately trained to use unfamiliar technical procedures and instruments. They should also be introduced to office and clerical procedures (Barros, 1988).

To ensure compliance with the CAP's accreditation requirements, all instruments and equipment should be properly operated, maintained, serviced, and monitored. Automatic pipettes used for quantitative dispensing must be checked for accuracy and reproducibility at specified, periodic intervals (CAP, 2006).

A review of the literature shows that there is a consensus about the importance of workload measurement as a management tool. On the other hand, the literature supports that it might be possible to develop a flexible, affordable template for measuring workload. It also reflects the importance of managing laboratory environment and instrument properly.

Chapter 3

Conceptual Framework

In this chapter, the factors that affect and affected by workload will be illustrated using a brief summary and a diagram. Moreover, a conceptual framework of clinical laboratory activities adopted and modified from the Canadian conceptual framework to be considered while conducting time study for each laboratory test will be presented.

3.1 Factors Affecting and Affected by Workload

The following diagram (Figure 3.1) presents factors related to working environment that affect and affected by workload. As a result, they may also affect the provision of an efficient and effective laboratory services. Those factors include the adequacy of space, the availability of good instruments, and whether workplace is safe, clean, healthy, and comfortable. Within this working environment internal factors also appear to affect and to be affected by workload. Those internal factors include employees' perception and communication with management. It also includes staffing decisions, the existing staffing level, and staff distribution. According to Shipp, staffing decisions for staffing levels and distribution should be rational and based on workload. On the other hand, employees should be involved in staffing decisions to improve their satisfaction and their perception about their workload and about their management; this requires effective communication skills to be held by management. Employees' perception about their workload also should be taken into consideration because employee's perception is essential in prediction of behavior and thus helping management to read warning signs early. According to Robert Smith, employees

burn out simply because they are asked to work too hard for too long (Smith, 2007). Henry pointed out that lack of management and communication is manifested by primary indicators; the first is the inability to maintain an adequate staff and the second is low morale in the laboratory (Henry, 1991).

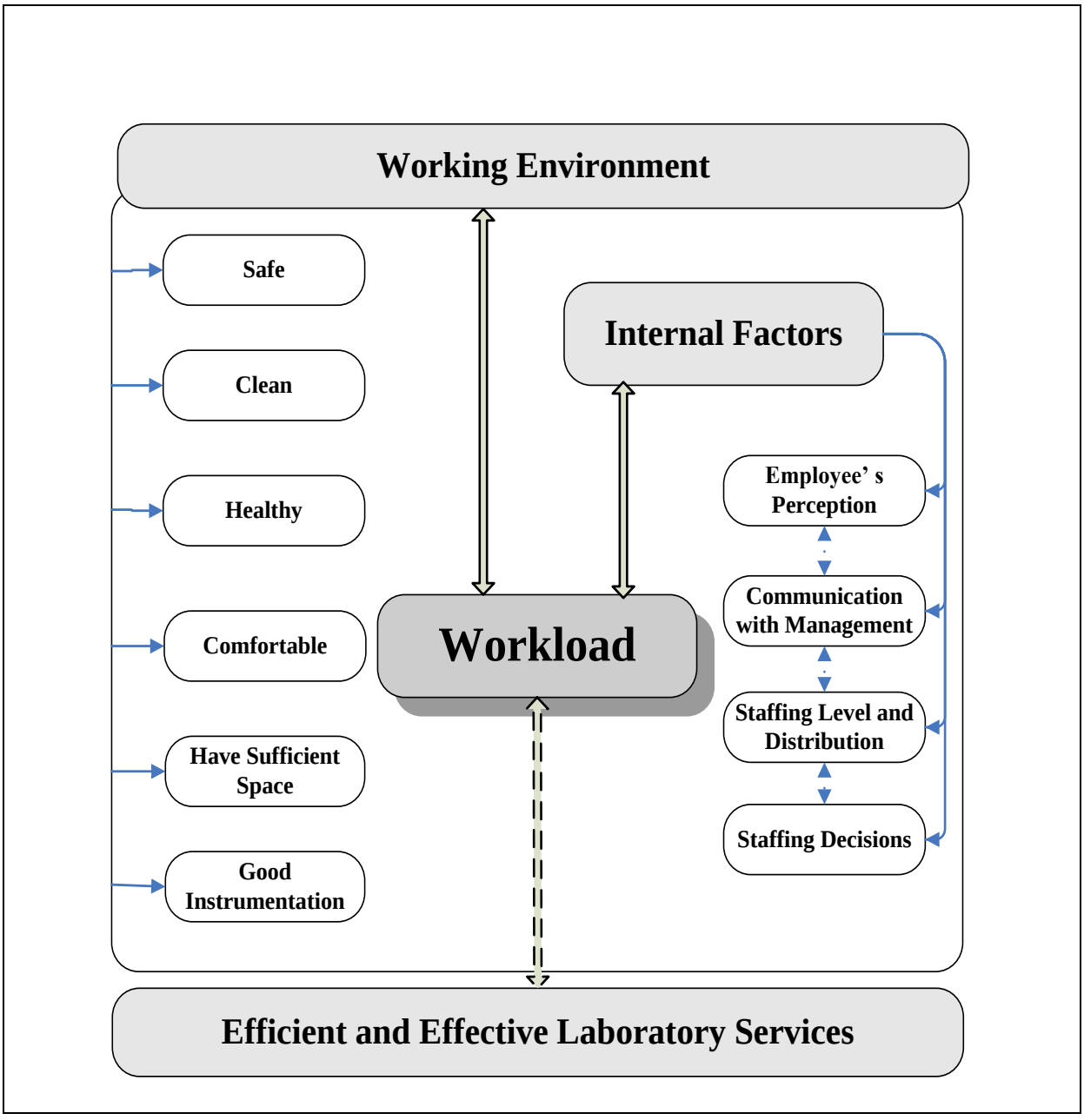


Figure 3.1: Factors Affect and Affected by Workload

In a study conducted by Isik et al (2007) the researcher recommend managers and policymakers to pay attention to the impact of deteriorated external work environment and heavy workload when developing strategies for employees' job satisfaction (Isik et al, 2007).

Poorly designed or uncomfortable work place can contribute to employees' dissatisfaction and fatigue. Dissatisfied and tired employees can't tolerate their workload, thus having difficulty in achieving both quantity and quality laboratory services. For this reason, management should pay attention to improve working environment in laboratories for example, through providing it with sufficient area and to ensure that temperature is tolerable.

The researcher suggests that all above mentioned factors are interrelated. For example, simple logic suggests that workload is one of the factors if not the sole factor that should be considered when determining staffing level. Workload also affects employees' perception and may affect their communication with management, also good communication with management may allow for more involvement in decision making, thus increasing employees' satisfaction about their workload. Improper working environment such as lack of space and instruments may contribute to increasing workload, thus affecting employee's perception about their workload, environment, and management. At the end all these factors affect the provision of high quality laboratory services.

Successful achievement of governmental medical laboratories mission in providing good quality require highly complex management activities. This requires the guiding of human and physical resources. Guiding of human resources require managerial skills as effective communication, it also require management tools as workload measurement system which

had been considered and an effective tool regarding staffing levels and distribution (Shipp, 1998 and Houang, & El-Nagen, 1993).

3.2 Clinical Laboratory Services Conceptual Framework

Following (Figure 3.2) presents the conceptual framework of clinical laboratory activities adopted and modified from the Canadian clinical laboratory services conceptual framework, to be considered while conducting time study for each laboratory test. The conceptual model illustrates the major categories of work and component activities for Clinical Laboratory.

Workload Categories	Service Recipient Activities			Non-Service Recipient Activities
Activities Categories	Specimen Collection	Specimen Testing	Technical Support	Management, Education and Research Activities
Activities	Preparation Service Recipient Instructions	Handling Testing Recording and Reporting Quality Control Instrument Set-up/Check	Solution/Media Preparation Sterilization Preventive Maintenance	Functional Centre Management Employee Meetings Workload Management Quality Management In-service Education Projects Travel

Figure 3.1: Clinical Laboratory Services Conceptual Framework.

A Workload Measurement System (WMS) for laboratories is defined as a tool for measuring the volume of activity provided by a laboratory in terms of a standardized unit time. Workload measurement system serves two main purposes. First, WMS is a management tool providing systematic quantification of workload in laboratories to assist in staffing, planning, budgeting, and performance monitoring. Second, as standard methods for recording workload, WMS yields uniform data for external reporting, permitting national and peer group comparisons.

The clinical laboratory WMS classifies workload into two major categories; service recipient activities and non-service recipient activities. Service recipient activities involve the delivery of services to or on behalf of a specific service recipient and consist of the following categories; Specimen Collection, Specimen Testing, and Technical Support Functions. These activities are further subdivided into components of observation for time study purposes. Non-service recipient activities that are integral to the functional laboratory's operations, but do not involve the delivery of services to service recipients include management, education and research activities.

For a workload measurement system to be implemented, a workload unit value for each laboratory test should be determined through the conduction of time study. In time study the all the entire activities for each test were timed using a stopwatch that started at the beginning of the first step of the test and continues throughout the entire activities. These activities include the time required for: specimen collection, specimen testing and technical support. Specimen collection includes all of the steps from the arrival of the specimen in the laboratory to the completion of all preliminary preparation and recording required before testing can

begin, e.g. time stamping the requisition, sorting specimens, recording service recipient demographic information, assigning a laboratory number (manual or computerized), entering information on a work sheet, labeling the specimen, separating serum from cells. Also, it should be noted that incubation time, centrifugation time, and waiting time are not included when performing time studies.

Specimen testing involves handling of test sample and testing, recording, quality control, instrument set-up and check, and finally reporting of test results. Specimen handling and testing includes all of the technical steps required to perform an activity or procedure up to the recording of the result, e.g. diluting a specimen, adding specimen and/or reagents, adjusting and calibration of instrument, putting on or removing a specimen on an instrument, counting, cutting, staining, and analyzing.

Recording and reporting includes all of the steps required in reporting result(s), or converting the recorded result(s) into a meaningful report, e.g. calculating the result(s), recording the results on the patient's report and in the laboratory records, typing, checking, sorting, filling, and sending out the final report, as well as telephone calls associated with the results and/or report. Checking quality control results and approving the reporting of results should also be considered.

Technical support activities include reagent preparation, preventive maintenance and sterilization activities. Reagent preparation includes time spent in the preparation of bulk reagent/solutions and preparation of quality control from lyophilized material. Preventive maintenance of instruments includes all normal and preventive maintenance procedures performed by laboratory. It also includes minor repairs, including the time spent identifying

the defect. It does not include repair of major breakdowns, or maintenance done by outside contractors. Washing, drying, sterilization activities, and cleaning of working area also included in the technical support activities.

Also, one should not ignore the non-service recipient activities such as management activities, in service education and research activities. In this study, the time study involved only the service recipient activities which include specimen collection, specimen testing, and technical support since it was very difficult to assess time required to perform non-service recipient activities.

According to the Canadian Management Information System, the external reporting at the provincial and national level may only require reporting of service recipient workload, however, it is recommended that managers implement the internal reporting of both service recipient care and non-service recipient workload in order to have a comprehensive picture of the staff's activity.

Chapter 4

Methodology

This chapter defines the activities of the research that was undertaken. It addresses the following items: study design, study population, eligibility criteria, setting of the study, ethical considerations, research instruments, pilot study, and data collection and analysis.

4.1 Study Design

A cross sectional study was carried out on the governmental primary health care medical laboratories in Gaze Strip. Beside the fact that cross-sectional studies can be thought of as providing a "snapshot" of the characteristics of the subjects under study at a particular point in time which may differ if another time frame had been chosen, it is relatively inexpensive and takes up little time to conduct. According to Levin (2006), cross sectional design used when the purpose of the study is descriptive and when there is no hypothesis, and it carries the advantages of being useful for public health planning, and for the generation of hypotheses. In addition, there is no loss to follow-up (Levin, 2006).

4.2 Study Population

All the eighty four medical laboratories employees working at MOH primary health care medical laboratories in Gaza Strip who have technical responsibilities in the field of laboratory at the time of study comprise the study population.

4.3 Eligibility Criteria

4.3.1 Inclusion:

All laboratory employees in primary health care (PHC) laboratories at MOH who have technical responsibilities at the time of the study, were included.

4.3.2 Exclusion:

1. Any employee who work out side the PHC laboratories.
2. Any employee who did not has direct responsibilities in laboratory technical work such as managers, secretaries, and cleaners were excluded from the employee survey.

4.4 Setting of the Study

The study carried out on MOH primary health care medical laboratories at Gaza Strip. At the time of the study there were thirty-two laboratories distributed over the five geographical districts of Gaza Strip.

4.5 Ethical Considerations

An official letter of approval obtained from Helsinki Committee "a Palestinian ethical committee" (Annex 3). Also, an official letter of request was obtained from the PHC Director General at MOH to conduct the study at MOH primary health care laboratories (Annex 4). Furthermore, each participant in the study received an explanatory letter attached to his questionnaire about the purpose of the study, confidentiality of the information and the fact that the participation is optional (Annex 5).

4.6 Instruments

Data had been collected using those instruments:

1. Self-administered structured employee questionnaire that was specially designed and prepared to get information about employees' perception of the existing workload, staffing decisions, and working environment (Annex 5). The questionnaire was constructed using questions formulated in Arabic language to avoid misinterpretation of the questions by the participants. Both open-ended and close-ended questions were included. Participants were asked to fill the questionnaire forms which were distributed during their working hours. The average time for filling a questionnaire was 15-20 minutes.

2. An observational checklist developed in Arabic language to get information about staff and working environment as relying on self evaluation of the staff is not enough (Annex 6).

3. An extraction sheet to record the observed time for each laboratory test performed at fifteen PHC laboratories (five level four laboratories and ten level three laboratories) obtained through the conduction of time study by well trained medical technologists (Annex 7).

4.6.1 Validity of Instruments Used:

The measurement of what is supposed to be measured is validity which is also the extent of unbiasedness of a measure (Garson, 1999). Both questionnaire and checklist were designed after reviewing relevant literature. They were also reviewed by several experts in the fields of

laboratories, management, and public health. As a result, some items were added, modified or deleted.

1.6.1 Reliability:

Analysis for internal consistency (of items in each category) measured by Cronbach's alpha, which also used for item deleted function to look for "rogue" questions – that is questions answered in a quite different and inconsistent way. Cronbach's alpha assesses the internal consistency of the questionnaire results, that is, do the items to be measured look at much the same thing?. An alpha of 0.7 or above is considered satisfactory by Garson, 1999. Cronbach's alpha test was performed for each category of logically related items and the following table presents the result of reliability test (Table 4.1).

Table 4.1: Reliability of Categorized Questions.

Category	No. of items	Reliability
Essentiality of Workload Measurement	3	0.724
Existing Workload	3	0.766
Staffing decisions	3	0.751
Communication with Management	3	0.855
Laboratory Environment	5	0.634
Maintenance Department Services	2	0.779

On the other hand, to minimize intra-observer variations, the researcher conducted a training session for all medical technologists who were responsible of conduction of time studies on how to conduct a time study to ensure standardization while collecting data. Also the process of time studies was supervised by the researcher to ensure that all medical technologists were following the same method in timing test procedures.

4.7 Piloting

A pilot of ten questionnaires and 3 checklists was conducted to examine the suitability of instrument used and to detect if there is a need for modification before starting. Accordingly, a minor change was made to the questionnaire. The pilot sample was included in the study because of the small sample size.

4.8 Data Collection

Data were collected using those previously mentioned instruments. For the questionnaire and checklist, the overall time needed to collect the data was one month (from May 1, 2007 to May 31, 2007). On the other hand, the time required to conduct time study for each test by fifteen well-trained medical technologists was two weeks. After finishing the collection of time study survey a meeting to discuss the acceptance of these results was conducted and attended by the director of MOH laboratories and blood banks directorate, and the director of MOH primary health care laboratories.

4.9 Response Rate

The response rate was high and reached 96% of the study population. This reflects employee's concern about the subject.

4.10 Data Entry and Analysis

Three different data entry modules were designed and data was entered for questionnaire, check list and the time study. Analysis was executed using the statistical Package for Social

Sciences, version 15 (SPSS). The stages for data analysis include: coding the questionnaire and checklist, data entry, data cleaning, constructing frequency tables for all the study variables, testing reliability for each categorized questions, and forming cross tabulation. In this study Chi Square was used and the examining of significance was at level 0.05. Most of the data that is reported in this study is descriptive. The researcher used standard approaches to statistical analysis of the questionnaire data including frequencies and descriptive summaries for the categorical data, means, ranges, and standard deviations for the time study were used. For the open ended questions, the answers were categorized manually.

Data cleaning were performed via reviewing frequency tables, random selection of questionnaire and checklist to ensure that accurate data entry was performed. As a result some data entry errors were found and corrected.

Negatively-keyed items were "reverse-scored" before performing reliability test; it was also done before computing individuals' total scores so that high scores on the questionnaire reflect relatively high levels of the attribute being measured by the questionnaire (Yaffee, 1999). Reverse-scoring the negatively-keyed items ensure that all of the items – those that are originally negatively-keyed and those that are positively-keyed are consistent with each other, in terms of what an "agree" or "disagree" implies.

4.11 Limitations

1. Minimum relevant literatures resources like books and journals,
2. Non-technical work wasn't included when conducting time study (non-service recipient activities),
3. The study cross-sectional design,
4. Hawthorn effect,
5. Unstable political situations, and
6. Inadequate reagent supply for laboratories hindered the conduction of time studies in some laboratories.

Chapter 5

Results

The results of this study address a descriptive assessment of PHC laboratories and their employee's perceptions about workload, and about working environment. Moreover, it presents the results of workload unit values for laboratory tests performed at primary health care laboratories. Descriptive results related to PHC laboratories were extracted from the observational checklist while results related to employees were extracted from the questionnaire. In addition, the results of the average workload units for each laboratory test - the backbone of workload measurement system- were extracted through the conduction of time study. Further analysis using chi square test and examination of significance at level 0.05 was performed.

5.1 Primary Health Care Laboratories

5.1.1 Types and Distribution:

PHC laboratories are divided into three levels according to the level of the clinic they belong to. Those levels are; level two, level three and level four. Only five out of thirty-two PHC laboratories (15.6%) are considered as level four and distributed over the five governorates of Gaza Strip as one for each governorate. Level three laboratories represents fourteen out of thirty-two PHC laboratories (43.8%), see figure (5.1).

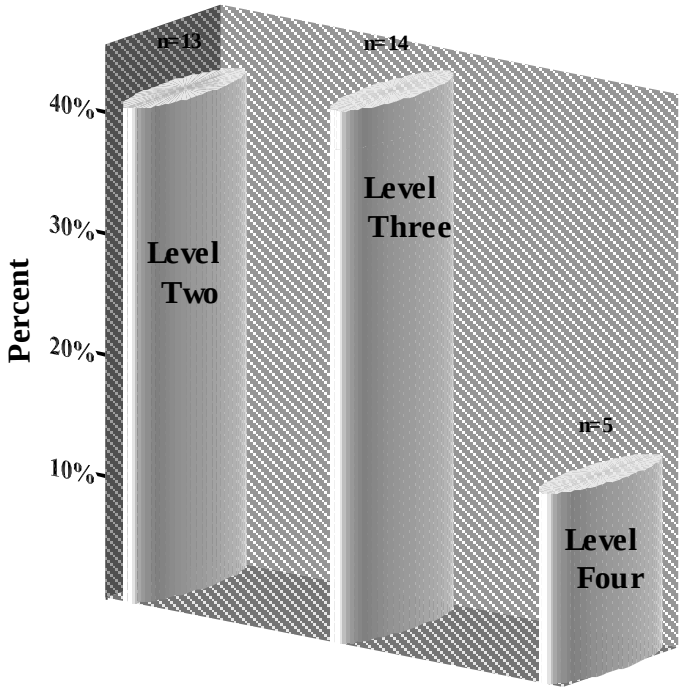


Figure 5.1: Distribution of PHC Laboratories by Level.

As shown by (Figure 5.2), these thirty-two laboratories are distributed over the five geographical governorates of Gaza Strip with the highest quota for Gaza governorate (10 laboratories) which represents 31.3% of laboratories. Also observed that, there were nine laboratories in the Midzone governorate which represents 28.1% of laboratories, five laboratories in the North, five in Khanuonis and three in Rafah.

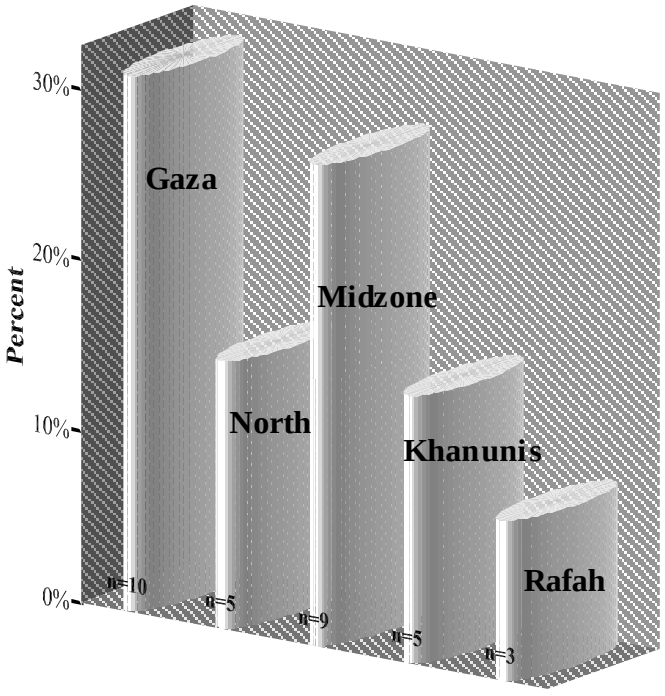


Figure 5.2: Distribution of PHC Laboratories by Governorates.

5.1.2 Staff Distribution

Table 5-1 summarizes data mentioned in Annex (8) which is related to the number of staff, number of tests performed, number of cases received, and both ratio (test per employee and case per employee) for each of the five governorates. Focusing on test per employee ratio reveals that there were no remarkable variations between North, Gaza, and Rafah governorates regarding this ratio.

However, there were a remarkable variation between those three governorates and Midzone and Khanuonis governorates. Also, the results show that the lowest test per employee ratio was related to the Midzone governorate. PHC laboratories, as depicted on the Annex (8) vary in component of staff, number of cases received and tests done by each laboratory. Accordingly the ratios of test per employee and case per employee vary from one PHC laboratory to another e.g. the lowest test per employee ratio was at al Mograka (1,166 test/employee) while the highest ratio (12,230 test/employee) was at Abu Shbak laboratory, however both laboratories have only one employee.

Table 5.1: Annual Number of Cases and Tests by Governorate.

	Governorate				
	Gaza	North	Midzone	Khanuonis	Rafah
Number of Employees	37	10	13	15	9
Total Number of Tests	276,320	70,206	56,252	57,200	63,802
Total Number of Cases	138,527	36,869	29,952	38,967	39,399
Test/Employee	6,176.8	6,923.4	3,587.8	3,728.8	5,637
Case/Employee	3,949.9	3,927.8	1,964.8	2,598.4	3,681.3

5.1.3 Laboratory Working Environment:

As observed through the observational checklist that laboratories vary in design and structure since they where constructed according to different specifications. The major observations are related to laboratory temperature, space, safety, and instruments. Those are summarized in the following paragraphs. Data observed through checklist revealed that 75% of laboratories don't have air conditioning or have a disrupted one. Regarding availability of space, only twelve out of thirty-two laboratories (37.5%) had sufficient working area, nineteen out of thirty-two (59.4%) had a sufficient area for instruments and out of the thirty

two, thirty laboratories (93.8%) had sufficient recording area. However, those who don't have sufficient working area use recoding area interchangeably (Table 5.2).

Table 5.2: Availability of Area for Working, Recording and for Instruments.

Item	Yes		No		Total	
	n	%	n	%	n	%
Sufficient Working Area	12	37.5	20	62.5	32	100.0
Sufficient Area for Instruments	19	59.4	13	40.6	32	100.0
Sufficient Area for Recording	30	93.8	2	6.3	32	100.0

Regarding safety, it had been observed that there was no biosafety manual available at any of the laboratories under study and that twenty nine out of thirty two (90.6%) of laboratories are provided with safety boxes which used to collect sharps to be incinerated. Only six out of thirty two (18.8%) of PHC laboratories separate their hazardous wastes from the domestic one (Table 5.3).

Table 5.3: Laboratory Medical Waste

Item	Yes		No		Total	
	n	%	n	%	n	%
Availability of Safety boxes	29	90.6	3	9.4	32	100.0
Separation of Medical Wastes	6	18.8	26	81.3	32	100.0

Regarding laboratory instruments, those related issues were observed: half of laboratories have at least one disrupted instrument and the majority of laboratories 84% (27 out of 32 laboratories) don't have all the operation manuals related to the instruments used. Also, 84% of laboratories don't have preventive maintenance records (Annex 9).

On the other hand, all laboratories used manual recording system and none of them had a computer or a fax. Beside the fact that all laboratories rely on telephone to communicate with management, only five out of thirty-two laboratories had a telephone set however others who didn't have a telephone set try to use telephone out side their laboratories. The researcher observe that 94% of laboratories communicate through official reports while 50% of the laboratories use direct communication through visiting the director of PHC laboratories in his office (Table 5.4).

Table 5.4: Communication with Administration "Checklist"

Item	Yes		No		Total	
	n	%	n	%	n	%
Using Direct communication	16	50.0	16	50.0	32	100
Through Official Reports	30	93.8	2	6.2	32	100
Using Telephone	32	100	0	0%	32	100

5.2 Characteristics of the Study Population

This study was conducted to include the eighty four laboratory employee who had technical responsibilities at primary health care laboratories which are distributed over the five geographical districts of Gaza Strip. Seven of these employees are working under special contracts. The response rate was high and reached 96% of the study population. As shown by the following chart (Figure 5.3), Gaza City represents (43.2%) of the study population while, the North governorate represents only (11.1%) of the study population. Only 18.5% of the subjects are working at level two laboratories while 43.2% of them are working at level four (Figure 5.4).

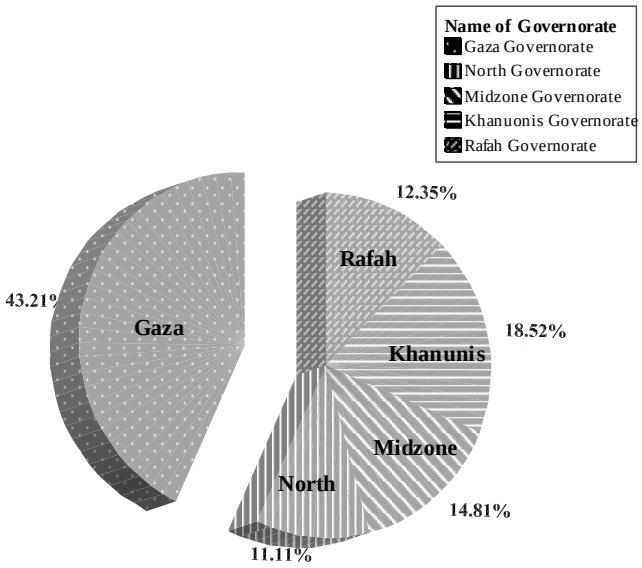


Figure 5.3: Distribution of the Study Population by Governorate.

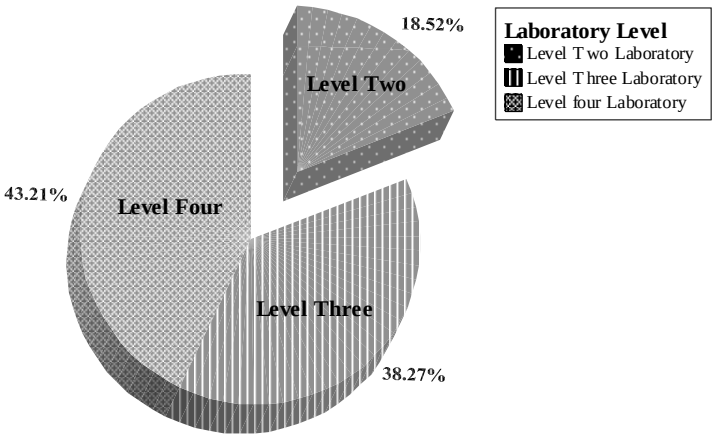


Figure 5.4: Distribution of the Study Population by Laboratory Level.

5.2.1 Socio demographic Characteristics:

In this study, as described in the following table (Table 5-5), females represent 71.6% of the study population, on the other hand the majority were married (93.8%), and 80.7% of the subjects were below 40 years old. The mean age of the subjects was 34.6 years with standard deviation (SD) 8.7 years, median 31 years and range from 24 to 59 years old.

Seven participants (8.6%) refused to answer the question related to there monthly salary. However, 41.9% of the participants who answered the question received less than 2000 NIS per month. The monthly salary ranged from 1652 to 4100 NIS. The average was about 2094 NIS with a standard deviation of 365.9 NIS. The median was 2000 NIS.

Table 5.5: Distribution of Study Population by Socio demographic Characteristics

Characteristic	Frequency	Percentage (%)
Gender		
Female	58	71.6
Male	23	28.4
Total	81	100
Marital Status		
Married	76	93.8
Single	5	6.2
Total	81	100
Age		
Below 30 years	38	46.9
30-40 years	27	33.3
Above 40 years	16	19.8
Total	81	100
Monthly Salary		
<=2000 NIS	43	58.1
> 2000 NIS	31	41.9
Total	74	100

5.2.2 Employment Status:

Employee's Qualification and Specialty:

More than half (56.8%) of the employees hold a bachelor degree; (39.5%) hold a diploma, (2.5%) hold a higher diploma, and only (1.2%) hold a master degree (Figure 5.5).

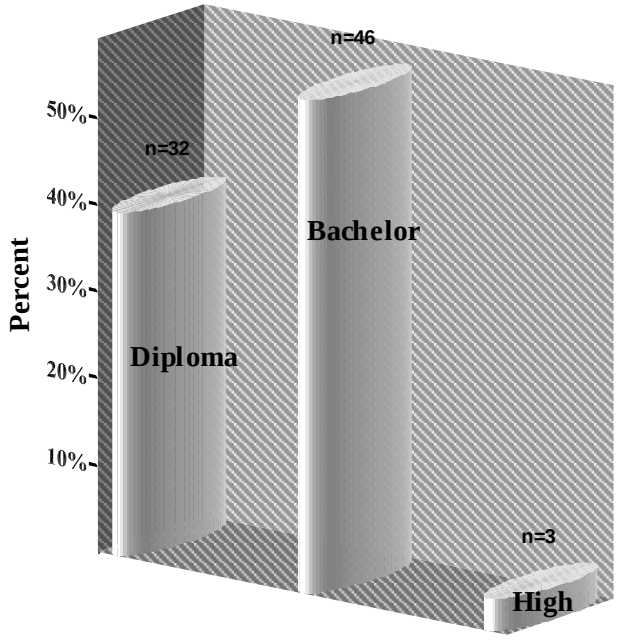


Figure 5.5: Distribution of the Study Population by Qualification.

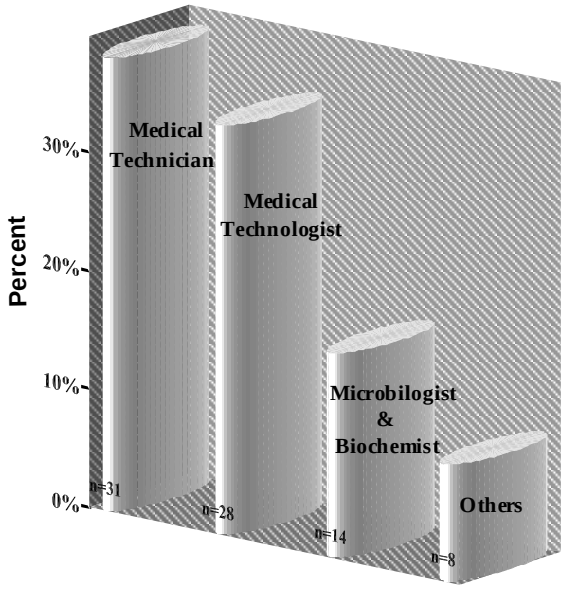


Table 5.6: Distribution of the Study Population by Specialty.

Furthermore, 38.3% were medical technicians, (34.6%) were medical technologists, (17.3%) were microbiologists or biochemists, and (9.9%) were of other specifications such as chemists and biologists.

5.2.2.2 Employee's Experience:

The general work experience at the field of laboratories for more than half of the employees (56.8 %) was from 5 to 15 years, while only 14.8% of the employees have more than 15 years experience. As summarized by the following table (Table 5.6), twenty one (25.9%) of the participants has managerial experience and twelve of them (57.1%) have more than 6 years of managerial experience.

Table 5.6: Employees Experience

Characteristic	Frequency	Percentage (%)
General Experience in the Field of Laboratories		
< 5 Years	23	28.4
5-15 Years	46	56.8
> 15 Years	12	14.8
Total	81	100
Managerial Experience		
<= 6 years	9	42.9
> 6 years	12	57.1
Total	21	100

5.2.2.3 Employees' Job Titles:

Regarding job title, about 26% of laboratory employees were holding managerial job titles, such as head of branch, head of sector, and supervisor (Figure 5.7). However, there was a statistically significant difference (p-value = 0.001) between males and females regarding this issue, since only 15.5% of females were holding managerial job titles compared to 52.2% of males who were holding those titles at the time of the study.

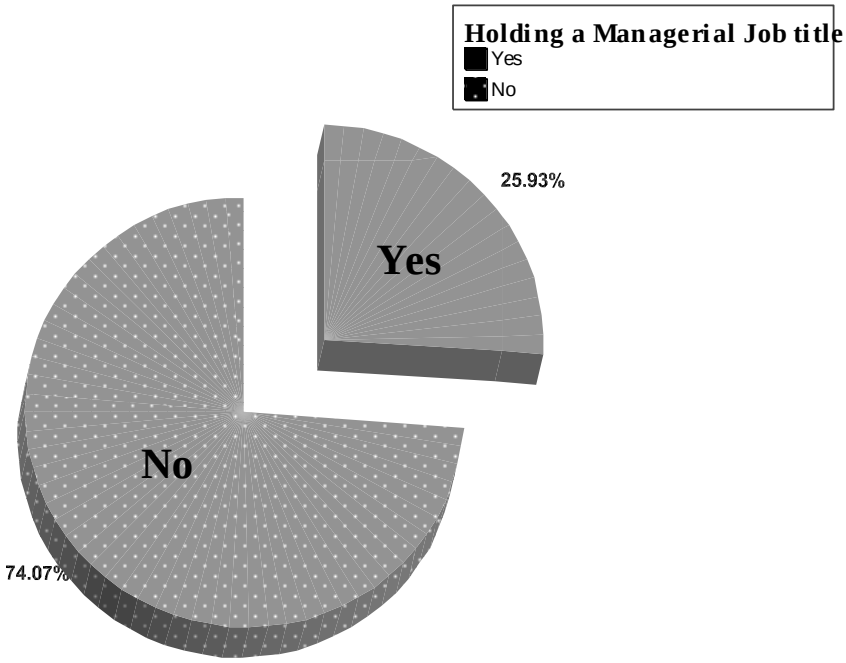


Figure 5.7: Percentage of Employees who Hold Managerial Job Titles.

Table (5-7) shows that females tend to hold managerial job titles less than males by approximately six times. On the other hand, more males (26.1%) have experience in the field of laboratories for more than 15 years than females (10.3%) and also more males (60.9%) have experience from 5 to 15 years than females (55.2%). However more females (34.5%) have experience below 5 years than men (13%), but p-value was 0.063 which didn't reach a statistically significant difference. Concerning experience in laboratory management there were more males (61.5%) who had experience for more than 6 years than females (50%) and less males (38.5%) had experience in laboratory management for less than 6 years than females (50%) however p-value (0.604) didn't reach a statistically significant difference.

Table 5.7: Distribution of Employment Characteristics by Gender

Characteristic	Male		Female	
	No.	%	No.	%
Managerial Job Title				
Hold a managerial job title	12	52.2	9	15.5
Don't hold a managerial job title	11	47.8	49	84.5
Total	23	100	58	100
Odds ratio = 5.94 …… C.I= (2.01 – 17.56)	X^2 = 11.52		p-value = 0.001	
Years of experience in field of laboratories				
Below 5 Years	3	13	20	34.5
From 5 to 15 years	14	60.9	32	55.2
Above 15 years	6	26.1	6	10.3
Total	23	100	58	100
	X^2 = 5.515		p-value = 0.063	
Years of Experience in Laboratory Management				
Below 6 years	5	38.5	4	50
Above 6 years	8	61.5	4	50
Total	13	100	8	100
Odds ratio = 0.625 …… CI= (0.105-3.707)	X^2 = 0.269		p-value = 0.604	

5.2.3 Knowledge about Workload and its Measurement:

Participants were asked about their knowledge of workload definition and its measurement. There answers pointed out that, 48 participants out of the 77 who responded to this question (62.3%) have heard about the "workload" term (Annex 10). Figure (5.8) shows that 36 participants out of 81 (44.4%) claim that there was a workload measurement standard at their laboratories and 28 of them (77.8%) state that workload measurement standard is based on the number of cases or number of tests performed by each laboratory as summarized in (Figure 5.8).

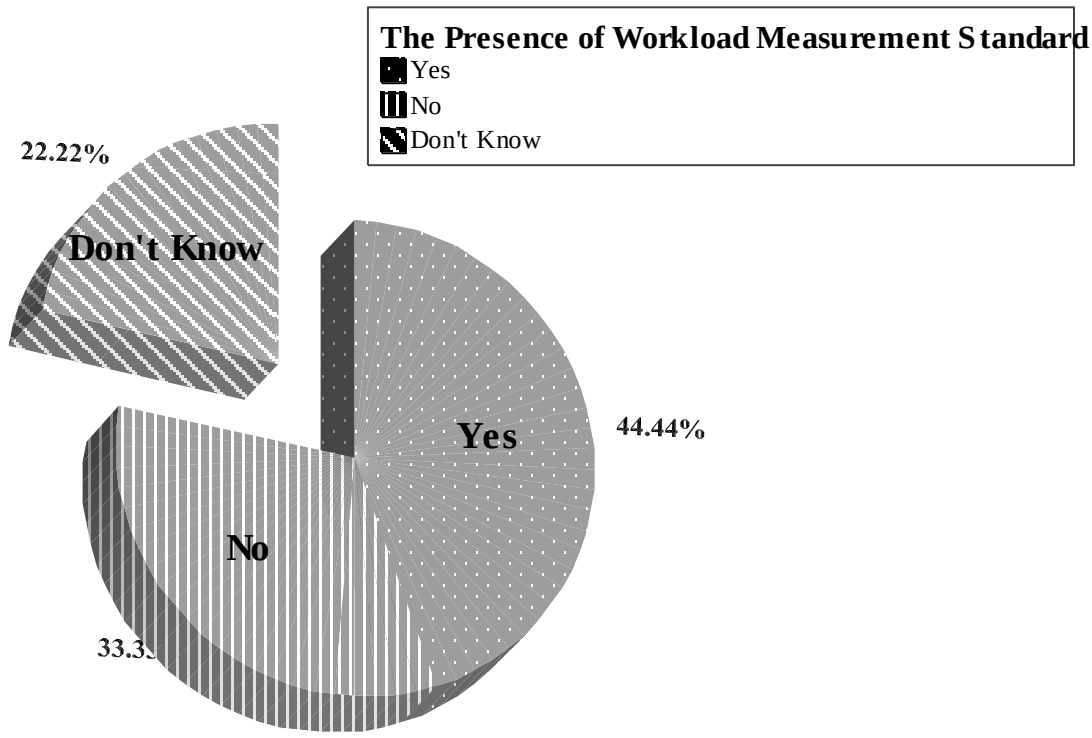


Figure 5.8: Presence of Workload Measurement Standard.

When participants were asked to define workload, their answers revealed that 30.6% of them were knowledgeable about workload definition as indicated by Houang, & EL-Nageh (1993) while about half of them think that it is defined as the number of tests or cases done by each laboratory (Annex 10). However as shown by table (5.9), only 11.3 % answered the question about the way workload could be measured as the number of tests multiplied by time required to complete the work, while 71.8% of the participants believed that it is measured via obtaining the number of tests only.

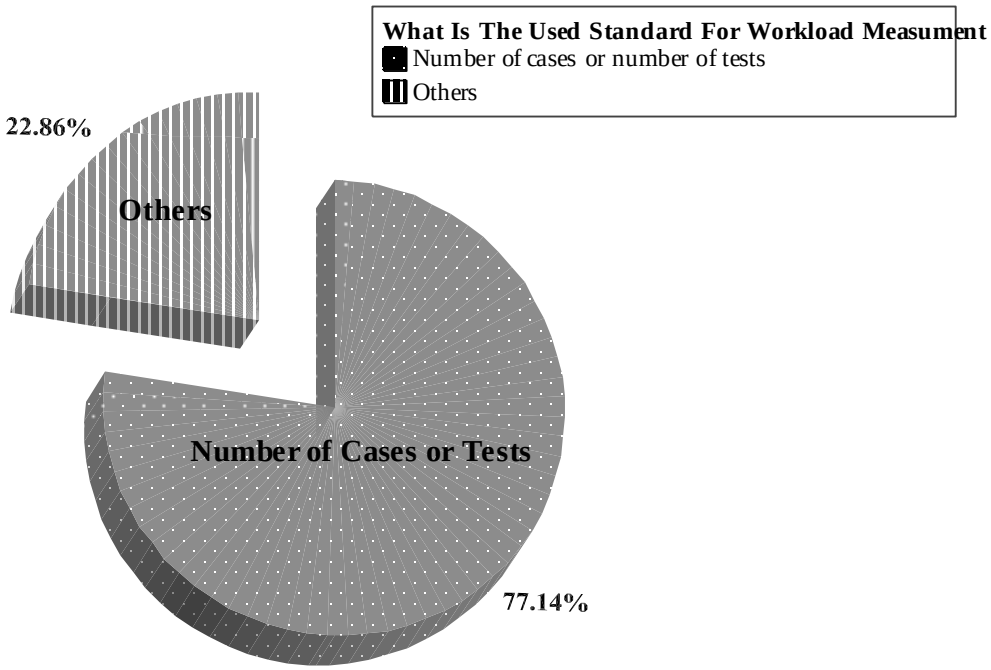


Figure 5.9: What is the Used Standard for Workload Measurement?

Table 5.8: Workload Measurement.

Workload Measurement	Frequency	Percentage (%)
Number of cases or tests performed	51	71.8
Sum of work multiplied by the time required to complete it.	8	11.3
Others	12	16.9
Total	71	100.0

5.2.4 Training and Education:

During their college or university studies, only 32.1% of the employees had received educational courses related to laboratory management. However, 75% of them participated in workshops during work and only 37.7% of them participated in workshops about laboratory management. Only 32.1% of employees receive training courses about laboratory safety. Table (5.9) summarizes data about training and education courses received by employees.

Table 5.9: Training and Educational Courses.

Item	Yes		No		Total	
	n.	%	n.	%	n.	%
Receiving educational courses about laboratory management	26	32.1	55	67.9	81	100
Participating in workshops during work	61	75.3	20	24.7	81	100
Participating in workshops about laboratory management	23	37.7	38	62.3	61	100

Further analysis revealed that there were differences between employees who held a managerial job titles and those who didn't regarding knowledge of workload measurement. Only 10% of laboratory employees who held a managerial job titles were knowledgeable of workload measurement compared to 11.8% of employees who didn't hold managerial job titles. In addition, 70% of employees who held managerial job titles believed that workload is measured by the summation of the crude number of tests performed or number of cases received compared to 72.5% of employees who didn't hold managerial job titles. Also, 20% of employees who held managerial job titles consider other things to be used for workload measurement such as reagent consumption and number of staff, compared to 15.7% who didn't hold managerial job titles. However, these differences between those who held managerial job titled and those who didn't doesn't reach a statistically significant difference (p-value=0.900). Moreover, only 4.3% of employees who received educational courses during their college or university studies were knowledgeable of workload measurement compared to 14.6% of employees who didn't receive such courses during their college or university studies. Also, 87.0% of employees who received educational courses during their college or university studies believe that workload is measured by the summation of the crude number of tests performed or case received compared to 64.6% of employees who didn't receive such courses. Additionally, 8.7% of employees who received educational courses during their college or university studies consider other things to be used for workload measurement compared to 20.8% of employees who didn't received such educational courses. However, these differences between those who receive educational courses during their college or university studies and those who didn't were not statistically significant (p-value 0.143).

About 14% of employees who participated in managerial workshops while working were knowledgeable of workload measurement compared to 11.4% who didn't participate in such workshops. Also, 71.4% of employees who participated in managerial workshops while working believed that workload measured by the summation of the crude number of tests or cases compared to 62.9% of employees who didn't participate in such workshops. And 14.3% of employees who participated in managerial workshops while working consider other things to be used for workload measurement compared to 25.7% of employees who didn't participate in workshops while working. However, these differences between employees who participated in workshops while working and who didn't, doesn't reach a statistically significant difference (p-value=0.597). See table (5-10).

Table 5.10: Knowledge of Workload Measurement among each Characteristic.

Characteristics	Workload Measurement						Total	
	Crude no. of tests multiplied by it's unit value		Crude no. of tests or cases		Others			
	No.	%	No.	%	No.	%	No.	%
Holding a Managerial Job Title								
Yes	2	10.0	14	70.0	4	20.0	20	100
No	6	11.8	37	72.5	8	15.7	51	100
$X^2 = 0.211$					p-value = 0.900			
Receiving Management Educational Courses								
Yes	1	4.3	20	87.0	2	8.7	23	100
No	7	14.6	31	64.6	10	20.8	48	100
$X^2 = 3.89$					p-value = 0.143			
Participation in Managerial Workshops while Working								
Yes	3	14.3	15	71.4	3	14.3	21	100
No	4	11.4	22	62.9	9	25.7	35	100
$X^2 = 1.03$					p-value = 0.597			

5.2.5 Employees' Perceptions:

5.2.5.1 Employees' Perception about Workload:

Based on logic and reliability analysis as previously mentioned in the chapter of methodology, related items (questions) were categorized under one category. Each category with its items is shown in the following table (5.11). The same table presents the mean of employees' perceptions with respect to essentiality of workload measurement, existing workload, staffing decision, and communication with management.

Table 5.11: Means of Employees Perceptions.

Category	Mean	Sum	SD
Essentiality of Workload Measurement	**4.31**	**349.00**	**0.62**
- Workload measurement is essential for laboratory management. - Workload measurement is essential for making decisions about staffing level and distribution. - There is a need to have workload measurement standard.			
Existing Workload	**3.29**	**266.67**	**1.00**
- Do you believe that you are work loaded - Do you believe that other staff in your laboratory are work loaded - Do you believe that other staff in other PHC laboratories are workloaded			
Staffing Decisions and Staffing Level	**2.76**	**223.67**	**0.93**
- Staffing decisions about staffing level and distribution are made objectively in my laboratory - Staffing level and distribution in our laboratories is fair. - Staffing level and distribution decisions are transparent.			
Communication with Management	**2.59**	**210.00**	**1.07**
- Before staffing decision, my manager informs us about his/her plans. - When my manager makes a decision about staffing level or distribution, he/she gives explanations about the selection method used. - I'm able to discuss staffing related issues with my manager			

Concerning employees' perception about the managerial essentiality of workload, table (5.11) shows that the mean of subjects' perception regarding this issue was 4.31, which indicate that the majority (about 86%) were aware of the managerial importance of workload measurement. See Annex (11) for more detailed results for each question.

The mean of employees' perception about their existing workload was 3.29, suggesting that about 66% of employees feel that they or their colleagues were overloaded. As employees were asked about factors attributed to their over-workload, their answers indicate that the major attributing factors were: inadequacy of staff, increasing work intensity, the increase in paperwork, frequent equipment failure, and the absence of a clear job description. The following table (5.12) presents the percentage of employees who believe that the mentioned factor attributed to his/her feeling of being overloaded.

Table 5.12: Factors Attributed to Employees' Over-workload

Factor n=45	n	Yes
Inadequacy of Staff	36	80%
Increasing Intensity of Work	36	80%
Increasing Paperwork	32	71.1%
Frequent Equipments Failure	31	68.9%
Absence of Clear Job Description	31	68.9%
Shortage in Reagent Supply	29	64.4%
Additional Job Duties	28	62.2%
Improper Working Environment	24	53.3%
Implementing Quality Assurance Program	19	42.2%
Training of New Employees or Trainees	18	40..0%
Work Neglected by my Colleagues	12	26.7%
Lack of Skills	1	2.2%

Regarding staffing level and staffing decisions, the mean of subjects' perception was 2.76, suggesting that about 55% of employees feel that staffing decisions and staffing level were fair, transparent or objective, while the other 45% don't.

The mean of subjects' perceptions regarding communication with management was 2.59, indicating that about 52% of employees feel that they communicate well with their manager regarding staffing issues in contrast to the other 48% who don't feel that they communicate well with their manager regarding this issue.

5.2.5.2 Employees' Perception about their Working Environment:

The perceptions of the employees with respect to their working environment, and instruments were summarized and discussed in the following paragraphs. Based on logic and reliability test, each related items in the questionnaire were categorized under one category, this was discussed in the chapter of methodology. Each category with its related items is presented in the following table (5.13) as well as the means of each category.

Table 5.13: Means of Employees Perceptions of Laboratory Environment.

Category	Mean	Sum	SD
Laboratory Environment	**2.76**	**223**	**0.77**
- My workplace is safe. - My workplace is healthy. - My workplace is comfortable. - My workplace is clean. - My laboratory has sufficient area.			
Maintenance Department Services	**2.24**	**100**	**0.52**
- Equipments and instruments are regularly maintained by maintenance department. - There is a rapid response form the maintenance department upon their notification			

The mean of subjects' perception regarding their laboratory environment was 2.76, suggesting that, about 55% of employees hold positive perception about their environment in respect of being safe, healthy, comfortable, clean, and having adequate space in contrast to the other 45% who do not.

The mean of subjects' perception regarding the service of maintenance department was 2.24, suggesting that about 45% of employees feel that maintenance department works properly, while 55% don't.

5.3 Workload Unit Values

A well trained fifteen laboratory technologists were responsible of conducting time study at their laboratories on tests that were carried out by their laboratories. Of these tests, only CBC was performed via automated technique while others were performed manually. To calculate unit value (UV), the observed test times were averaged and summarized in tables (5.14, 5.15, 5.16, & 5.17). In each table (n) represents the number of time observations made by the laboratory technologists

5.3.1 Haematology:

Table 5.14: Workload Unit Values (minutes) for Haematology Tests

Laboratory Test	Method	N	Mean UV/min	SD	Median	Mode	Minimum	Maximum
Hb	M*	11	3.5	0.5	4.0	4.0	3.0	4.0
CBC	A*	7	2.7	1.2	2.0	2.0	2.0	5.0
WBCs	M	5	6.0	1.0	6.0	5.0	5.0	7.0
ESR	M	15	3.3	1.1	3.0	3.0	2.0	5.0
Blood .gp & Rh	M	14	4.1	1.0	4.0	3.0	3.0	6.0

- **M: Manual and A: Automation**

An analysis of the data denoted variations in the amount of time expended on performing each tests in laboratories. The average time for hemoglobin (Hb), Complete blood count(CBC), White blood cells count (WBCs), Erythrocyte sedimentation rate (ESR), and blood grouping and Rh (Blood .gp. and Rh) test are respectively 3.5, 2.7, 6.0, 3.3, and 4.1 minutes. Table (5.14) summarizes the results of time study performed for each hematological test. A closer look shows a remarkable variation between minimum and maximum unit values for CBC, ESR, and Blood grouping when compared to Hemoglobin minimum and maximum values.

5.3.2 Chemistry:

Table (5.15) presents the time study results for each chemistry test performed at PHC primary medical laboratory. For example, the unit value for glucose ranged from 5 to 7 minutes with an average of 6.3 minutes, a standard deviation (SD) of 0.8, a median of 7.0 minutes, and a mode of 7 minutes. For urea, creatinine, uric acid, cholesterol and triglyceride the mean unit values were 7.9, 8.1, 6.6, 6.5, and 6.5 respectively. The highest variation between minimum and maximum unit value were observed for urea and creatinine test.

Table 5.15: Unit Values (minutes) for Chemistry Tests

Laboratory Test	Method	n	Mean UV/min	SD	Median	Mode	Minimum	Maximum
Glucose	M	13	6.3	0.8	7.0	7.0	5.0	7.0
Urea	M	10	7.9	1.3	8.0	8.0	6.0	10.0
Creatinine	M	10	8.1	1.4	9.0	9.0	6.0	10.0
Uric Acid	M	10	6.6	0.9	6.5	6.0	5.0	8.0
Cholesterol	M	11	6.5	1.0	7.0	7.0	5.0	8.0
Triglyceride	M	10	6.5	0.9	7.0	7.0	5.0	8.0

- **M: Manual**

5.3.3 Serology:

The average unit value for each serological test is summarized in table (5.16) for example; the average time UV for rheumatoid factor was 5.9 minutes with a SD of 0.9, a median of 6.0, and a mode of 6.0 and a range of 4.0 to 7.0 minutes. For C - reactive protein, Anti-streptolysin O titer, Brucella, and Pregnancy the average unit value in minute were 5.9, 5.9, 6.0, and 5.2 respectively.

Table 5.16: Unit Values (minutes) for Serology Tests

Laboratory Test	Method	n	Mean UV/min	SD	Median	Mode	Min	Max
Rheumatoid Factor	M	10	5.9	0.9	6.0	6.0	4.0	7.0
C-Reactive Protein	M	10	5.9	0.9	6.0	6.0	4.0	7.0
Anti-Sreptolysin O titer	M	10	5.9	0.9	6.0	6.0	4.0	7.0
Brucella	M	4	6.0	0.8	6.0	6.0	5.0	7.0
Pregnancy Test	M	12	5.2	0.8	5.1	5.0	4.0	7.0

- **M: Manual**

5.3.4 Urine Analysis and Parasitology:

The average unit value for urine analysis was 5.6 minutes with a SD of 1.2, a median of 5.0, and a mode of 5.0 and a range of 4.0 to 8.0 minutes. On the other hand the average unit value for stool parasitology analysis was 4.9 minutes with a SD of 1.2, a median 5.0, and a mode of 5.0 and a range of 3.0 to 7.0 minutes (Table 5.17). There was a remarkable variation for each test between the minimum and maximum values.

Table 5.17: Unit Values (minutes) for Urine and Stool Parasitology Tests

Laboratory Test	Method	n	Mean UV/min	SD	Median	Mode	Min	Max
Urine Analysis	M	15	5.6	1.2	5.0	5.0	4.0	8.0
Stool Analysis	M	14	4.9	1.2	5.0	5.0	3.0	7.0

- **M: Manual**

Chapter 6

Discussion

6.1 Staff Distribution and their Characteristics

Thirty-two PHC laboratories were distributed over the five geographical districts of Gaza Strip with the highest quota for Gaza Governorate (ten laboratories) as it represents the highest population among other governorates. Midzone governorate has nine laboratories which serve less population than Gaza, thus lowering test per employee ratio for the Midzone when compared to Gaza Governorate.

Study results show that, staff distribution in PHC laboratories is not based on the number of test performed or number of cases received. This was confirmed by the remarkable variation in the test per employee and the case per employee ratios among laboratories e.g. the highest test per employee was found at Abu Shbak laboratory (12,230 test/employee/year) while the lowest test per employee (1166 test/employee/year) was at Al Mograka. However, both laboratories have only one employee. These conclusions disagree with employees' opinion as 45.7% of them believe that staff distribution is based on the number of tests performed (Annex 9). Regarding this issue, several literature had considered the method of using the crude number of tests or cases as workload measurement or as a base for staffing decisions unsuitable (The Royal College of Pathologists, 2005, Houang & EL-Nageh, 1993, and Cartwright, Davies, Dulake, Hart, Morris, & Wilkinson 1985). On the other hand, the Director of Laboratories and Blood Bank Directorate stated that, there is no accurate standard available for workload measurement or staffing decisions and that the distribution of staff is

based roughly on several factors such as the number of tests were performed, the number of available staff and the type of laboratory whether it is a hospital or PHC laboratory.

Regarding gender, females represent higher percentage than males in this study as 71.6% of the study population were females, and the male/female ratio is approximately 0.4 compared to 1.025 male/female ratio for Gaza Strip population according to the Palestinian MOH annual report. (Palestine, MOH, 2006). This distribution is extremely far from the normal distribution indicating that females are more interested in this field than males since most of students who join universities to study this branch are females. A consistent finding with our results was reported in USA where clinical laboratory professions are female-dominated and represents about 79%, indicating that even in USA, females tend to be more interested in this field than males (Lindler & Champan, 2003).

Besides being the majority, females tend to hold managerial job titles less than males by approximately six times. This difference is considered statistically significant (p-value = 0.001). However, there were no statistically significant difference between males and females related to their years of experience (p=0.063) or years of managerial experience (p=0.604). Seemingly, the dominating culture effect is responsible since it considers women to have less managerial capabilities and where family is the first priority for women. These findings are similar to those from the study by Thabet about managerial positions in Gaza hospitals (Thabet, 2004).

As mentioned in the chapter of results, more than half (56.8%) of the employees hold a bachelor degree, 39.5% hold a diploma, 2.5% hold a higher diploma, and only 1.2% hold a master degree. However, the researcher observed that employees with bachelor degree perform tasks similar to those holding diploma as well as employee who hold master degree

indicating the absence of clear job description which was one of the managerial related items that was complained by 26% of employees while answering the open-ended question about things that they don't like. The researcher tends to agree with Barros, who pointed out the importance of assigning duties to be commensurate with employee's education, training, and experience. Barros, suggests that a highly educated and qualified staff member should not be assigned duties that someone less qualified can perform, so that over-qualified employees don't become bored, frustrated, and disgruntled (Barros, 1988).

6.2 Knowledge of Workload

Concerning knowledge of workload and its measurement, 62.3% of employees have heard of the "workload" term. About 44.4% of the employees think that there is a workload measurement standard at their laboratory and 77.1% of them stated that the standard is based on the number of cases or number of tests performed by each laboratory. This is despite the fact that there is no such standard. A fact that was confirmed by Dr Randa El-Khoudary, the director of laboratories and blood banks directorate (Director of laboratories and blood banks directorate, October 2007, Interview).

The research findings demonstrate that, only 30.6% of employees were knowledgeable of the workload definition as indicated by (Houang & EL-Nageh, 1993) and (Wiktionary, 2007). However, only 11.3 % of the study employees gave the right answer according to Houang & EL-Nageh (1993) to the question related to workload measurement. About 71.8% of the participants believe that, workload is measured via obtaining the number of tests done by each laboratory. Further analysis revealed that, the difference between employees who held a managerial job titles and who don't regarding knowledge of workload measurement was not statistically significant (p-value=0.900). Moreover, the difference in knowledge of workload

measurement between employees who received managerial courses during their graduation study and who didn't was not statistically significant (p-value 0.143). Also, for the difference in knowledge of employees regarding workload measurement between employees who participated in managerial workshops during work and who didn't was statistically insignificant (p-value=0.597) suggesting that, lack of knowledge about workload measurement among employees could be attributed to the fact that educational courses or material received by employees during graduation studies or during work doesn't include topics related to this issue.

6.3 Employees' Perception

6.3.1. Employees' Perception of Workload and Staffing Decisions:

On the subject of the employees' perception about the managerial essentiality of workload measurement, about 86% of them were aware of managerial essentiality of workload measurement especially for decisions related to staffing level. Thus, they tend to agree with those opinions mentioned in the chapter of literature review about the managerial importance of this issue. Therefore, it is expected that an implementation of a workload measurement system will be supported by the employees.

In this study, 66% of employees felt that they or their colleagues were overloaded and relate this feeling to five major factors: inadequacy of staff, increasing work intensity, increasing paperwork, frequent equipment failure and absence of clear job description. This supports the fact that attempts to develop workload measurement system should be supported as stated by Shipp, in his manual "workload indicators of staffing need (WISN)", that having a rational

method for setting the correct staffing levels in health facilities is critical. However, other efforts regarding the establishment of full computerized recording system and effective management of equipment should be addressed.

About half of employees (55%) had positive perceptions about staffing decisions and staffing level in the sense of being fair, transparent or objective, while the other 45% don't. This could be explained by the lack of a formal standard on which staffing decisions were based as "employees were roughly distributed on the based of the number of available staff, the number of tests performed by each laboratory and the type of laboratory whether it's a hospital of PHC laboratory" as stated by the Director of Laboratory and Blood Banks Directorate:(Director of Laboratory and Blood Banks Directorate (October 2007), interview).

Concerning communication with management, about 52% of the employees thought that they communicate well with their manager regarding staffing issues while 48% didn't think so. This finding could be supported by the data collected through the observational checklist, where about half of laboratories seemed to depend on direct communication with their manager through visiting his office. Seemingly, employees who work at those laboratories may express their satisfaction about communication with management. In addition, although all laboratories staff depends on using telephone to communicate with management, only five out of thirty two laboratories had a telephone set. This could be the reason beyond the negative perception held by 48% of employees regarding communication with management. Moreover, there was no computer network or fax machine that may facilitate communication with management. All those aforementioned causes may hinder communication with management therefore lowering their perception about communication. This finding was also

supported by the comments of 26% of employees -while answering an open ended question- who dislike some managerial related issues such as poor communication with their managers.

6.3.2 Employees' Perception of their Working Environment:

Findings regarding employees' perceptions with respect to their working environment, and instruments revealed that 45% of employees held a negative perception about their working environment. This could be explained by the improper working conditions observed by the researcher during conducting the study. An example of that is the unavailability of air conditioning as about 75% of laboratories didn't have air conditioning, or had a disrupted one. Similarly, about two thirds of laboratories (62.5%) didn't have sufficient working area at the time of the study and about (41%) percent of laboratories didn't have sufficient area for instruments. However, most of laboratories (93.8%) had sufficient recording area. The researcher observed that those who didn't have sufficient working area use recoding area interchangeably. One challenge that became apparent during the assessment of sufficient area during observation was the absence of an international agreement on the provision of work apace in laboratories as stated in the WHO publication on safety in healthcare laboratories (WHO, 1997). However, the researcher relied on her observation to give a rough estimation about the availability of a minimum separated area for bench working, recording and for each instrument. Employees' dissatisfaction with their environment was also expressed while answering the question about things that they don't like where 48% of employees complained from having inappropriate working environment such as insufficient working area, uncontrolled temperature, laboratory design and position. Also, about 38% of them state that, if they were in charge, their first priority decision would be to improve working environment via providing laboratories with sufficient working area and restructuring of laboratories. Also

it was observed that, there was no biosafety manual available at any of PHC laboratories and that only six out of thirty two PHC laboratories (18.8%) separate their hazardous wastes from the domestic one. The researcher concluded from the previous discussion that, improper working conditions such as insufficient working area influenced employees' perception about their environment and thus their satisfaction which may indirectly affect employee productivity in term of providing an effective and efficient laboratory service. This conclusion agrees with Robbins, and thus efforts regarding improving working conditions should be supported.

The researcher observed some instrument related issues, such as the unavailability of the instruments operation manuals in 84.4% of laboratories, and the presence of at least one disrupted instrument in 50% of laboratories. The later could be the reason behind the negative perception held by 55% of employees about the maintenance department. This perception was confirmed when 40% of employees considered some instrument related issues as frequent instrument failure and the remissness of maintenance department among things that they dislike while answering the open ended question. It was also stated by 41% of employees that, if they were in charge, their first priority decision would be to improve management of instruments via training of employees on the use of instruments and working on improving the service of maintenance department. During her observational tour, the researcher was told by employees that they think that they didn't receive adequate training on the use of instruments, and the source of their knowledge was the experience of their colleagues. Also, some of them claim that sometimes they carry out the responsibility of repairing instruments' defects. Accordingly, this inadequate knowledge of training in the use of the instruments could be one of the causes of the frequent equipment failure in PHC medical laboratories. This conclusion was supported by the WHO publication on safety in

health-care laboratories where lack of knowledge and training in the use of apparatus is considered as a common factor in equipment related accidents (WHO, 1997). This issue also was addressed by Barros, who recommended that, every new employee should be adequately trained to use instruments (Barros, 1988).

6.4 Determining Workload Unit Value for Each Test

In laboratories, the cornerstone of the Workload Measurement System to be developed is the determination of unit value per test. One workload unit is equal to one minute of unit-producing personnel time spent performing service recipient and non-service recipient activities of the functional centre. In this study, determination of workload unit value was based only on the time spent performing service recipient activities since it was very difficult to assess the time of performing non-service recipient activities such as teaching, training and research. Laboratory activates considered during the conduction of time study included the time required for: initial handling of the specimen, all steps involved in specimen testing, recording and reporting, reagent preparation, and preventive maintenance.

The trained fifteen laboratory technologists were responsible for conducting the time study; each one at his laboratory only timing the tests that were carried out by his laboratory. As a result, the number of observations differs from test to test. Also, the lack of reagent supply in some laboratories hinders the conduction of time study for some tests, thus lowering the total number of observations for those tests. The results of these observations were averaged to determine the workload unit for each laboratory test.

Average unit value for Hb, CBC, WBCs, ESR, and Blood grouping & Rh were 3.5, 2.7, 6.0, 3.3, and 4.1 minutes, respectively. To explain the remarkable variation between minimum and maximum unit values for some tests, the researcher suggests that this could be the results of multi factors. One of the factors, for example, is the availability of an automated mixer to ensure the homogeneity of blood samples in some laboratories for CBC test, while others don't have such instrument instead they relay on manual mixing. This increases the time required to perform CBC test in some laboratories. Also, the availability of ready to use ESR tubes in some laboratories while others tend to prepare them manually explain the variation between minimum and maximum unit values for ESR. Blood grouping and Rh require more time for the negative Rh results compared to the positive ones which require less time and this could be the reason for the observed variation between minimum and maximum unit values. On the other hand, the average unit value for WBCs shows similarity with UNRWA, CAP, and the Canadian unit values. However the results for Hb and CBC show little variation. ESR and Blood grouping results were close to UNRWA unit values results (Annex 2).

For chemistry tests, the average unit value for Glucose, Urea, Creatinine, Uric Acid, Cholesterol, and Triglyceride were 6.3, 7.9, 8.1, 6.6, 6.5, and 6.5 respectively. The highest variation between minimum and maximum unit values was observed for Urea and Creatinine tests which may be explained by availability of programmed photometer used for reading of results in some laboratories while other laboratory still work with the old one which requires programming and thus needs more time before reading the results. On the other hand glucose unit value (6.2) shows little difference from UNRWA unit values (Annex 2).

Concerning serology tests, the average unit values for RF, CRP, ASOT, Brucella, and Pregnancy test were 5.9, 5.9, 5.9, 6.0, and 5.2 respectively. They are very close to UNRWA unit values (Annex 2). Also, the variation between the minimum and maximum unit value for

each test may be explained by variation in experience of employees who perform the test since reading of serological test require skills. Also, the microscopic examination for both urine and stool examination require special skills and experience and this could be the reason beyond the remarkable variation between minimum and maximum unit value for each test.

Extensive review of the literature especially, that which includes workload unit values adopted by the Canadian Medical Laboratories, UNRWA laboratories, College of American Pathologists, and some countries of the Eastern Mediterranean Region indicate that some workload unit values tend to be similar for some tests and different for the other tests. Those differences could be related to several factors such as the mechanization of tests, whether the test was performed individually or in a batch (aggregate), whether non-service recipient activities included or not, whether recording is a computer based or performed manually. It is also affected by the level of experience for the staff who perform time study. This explains why some unit values estimated through this study differ from that reviewed by the researcher in the aforementioned literature (Canada, CIHI, 2006, UNRWA, 2006, Houang & EL-Nageh, 1993, and Henry, 1991).

However, for any organization it is possible to develop a flexible, affordable template for measuring workload. The determined workload units by the research could be the cornerstone of a comprehensive workload measurement system in the Palestinian governmental laboratories. On the other hand, it is recommended to revise those units regularly to maintain the validity of the time. These certainly should be done when there is a consensus among the staff that the time does not reflect current practice.

Chapter 7

Conclusion and Recommendations

7.1 Conclusion

Primary health care medical laboratories play a vital role in providing a high quality service to meet needs of clients, the community and health staff and to ensure a high quality of laboratory service it should be well managed. A realistic and accurate assessment of laboratory workload is necessary for effective distribution of resources between laboratories and for good laboratory management. The primary objective of this study is to develop workload measurement in governmental PHC laboratories at Gaza Strip to serve as a management tool. After a comprehensive review of relevant literature, this objective was accomplished through the determination of workload unit values for each laboratory test through the conduction of time study.

The literature supports the notion that it is possible to develop a flexible, affordable template for measuring workload. It also reflects the importance of managing laboratory environment and instrument properly. But unfortunately, there is a precious little research on assessing laboratory employees' perception about workload.

There are several factors that affect and are affected by workload such as staffing level and distribution. A comprehensive analysis of staff distribution in governmental PHC medical laboratories indicates that there were remarkable variations in test per employee ratio among

each laboratory which reveals that staff distribution is not based on the number of tests performed by each laboratory.

Employees' knowledge about workload measurement tends to be low since only 11.3 % of the employees were knowledgeable of the right method for measuring workload. The lack of knowledge regarding workload measurement could be attributed to the fact that educational courses or material received by employees during their college or university studies or during work didn't include topics related to this issue.

The researcher expects a strong support from the employees if a workload measurement system ought to be developed and implemented. This is based mainly on the findings since about 86% of laboratory employees were aware of managerial essentiality of workload measurement especially for decisions related to staffing level.

The study revealed that 66% of the employees believed that over-workload exists in PHC laboratories and they attributed their feeling of being overloaded to factors such as inadequacy of staff, increasing work intensity, increasing paperwork, frequent equipment failure and absence of clear job description. The absence of formal standard on which rational staffing decisions could be made, lies behind the negative perception expressed by 45% of employees regarding staffing decisions in the sense of being fair, transparent and objective. The lack of communication tools such as telephone, fax, and computer network explains the negative perception expressed by 48% of employees about communication with management regarding staffing issues.

About 45% of the employees held negative perception about their working environment which may be attributed to improper working conditions such as unavailability of working

area in about 62.5% of the laboratories. In addition, 55% of employees were dissatisfied of the service provided by maintenance department since 50% of laboratories have at least one disrupted instrument.

The study results showed that average unit value for Hb, CBC, WBCs, ESR, and Blood grouping & Rh were 3.5, 2.7, 6.0, 3.3, and 4.1 minutes respectively. Also, for chemistry tests, the average unit value for Glucose, Urea, Creatinine, Uric Acid, Cholesterol, and Triglyceride were 6.3, 7.9, 8.1, 6.6, 6.5, and 6.5 respectively. Concerning serology tests, the average unit value for RF, CRP, ASOT, Brucella, and Pregnancy test were 5.9, 5.9, 5.9, 6.0, and 5.2 respectively. Also for urine and stool analysis the average unit value was 5.6 and 4.9 respectively.

7.2 Recommendations

After analyzing the data and reviewing the findings, the researcher made the following recommendations:

1. Improving workload measurement in PHC laboratories since the total number of test performed by each laboratory could be a misleading workload measurement.
2. Utilizing the workload unit values determined by the researcher through the conduction of time study to develop workload measurement system in the governmental medical PHC laboratories.
3. Ensuring that the workload term is used properly in the ministry of health annual report since it was used to express test per employee ratio which had been criticized as an improper method for workload measurement.
4. Establishment of a workload measurement unit under direct supervision and management of laboratories and blood banks directorate to carry the responsibility of analyzing workload statistics, and submitting workload reports which could be used in planning and management, and also to be responsible for the continuous revision of unit values.
5. Development of a laboratory information system.
6. Empowerment of women by providing equal opportunities for males and females regarding managerial jobs.
7. There is a need for a clear job description, so that highly qualified staff member should not be assigned duties that someone less qualified can perform.

8. Raising knowledge of workload and its measurement via integration of related topics in the educational materials received during college and university studies and through workshops.
9. Activities regarding effective communication with management should be considered through the arrangement of periodic meeting between staff and management.
10. More involvement of staff in decision making enhances commitment and reduces resistance.
11. Improving working environment by providing laboratories with sufficient space and controlled temperature.
12. Every new employee should receive comprehensive introductory courses before commencing practical laboratory work duties. These courses should include in-service training on safety measures and on the use of instruments.
13. Coordinate periodic maintenance of instruments with maintenance department.
14. Empowering the monitoring bodies to ensure separation of hazardous waste from other waste at source,
15. Researchers are advised to make further studies about
    - Workload measurement in hospital laboratories
    - Workload measurement in other health professions.
    - Staffing and workload benchmarking.

References:

Abu Shaa'ban, K., (2007): **Quality Assessment of Governmental Laboratory Services in Primary Health Care Centers in Gaza Strip**. Al-Quds University, Palestine.

The American Association of Critical-Care Nurses AACN (2005): "AACN Standards for Establishing and Sustaining Healthy Work Environments: A Journey to Excellence". American Journal of Critical Care. **14**. 187-197

Akers, L., (2002): Workload measurement system: Court executive development program, phase 3 project. St. Louis County Circuit Clerk, Missouri.

Barros, A. (1986): "Making CAP workload recording work for you - College of American Pathologists' workload recoding method - column" Medical Laboratory Observer, http://findarticles.com/p/articles/mi_m3230/is_v18/ai_4571234 (24 Oct. 2007)

Barros, A., (1988): "Identifying the causes of low productivity". Medical Laboratory Observer.
http://findarticles.com/p/articles/mi_m3230/is_n4_v20/ai_6592131 (24 Oct. 2007)

Beastall, G., (2004): **Clinical Biochemistry Workload Trends 2000-2004: The Impact of the General Medical Services Contract.** Royal College of Pathologists, UK.
www.cmmc.nhs.uk/.../deptlabmed/cg/audit/rcpath**Clinical**%20**Biochemistry**%20**Workload**%20**Trends**%202000-**2004**2.doc

Bennett, C., (1991): "WELCAN UK: its development and future". Journal of clinical Pathology, **44**. 617-620.

Bonnie, R., (1993): "LMIP: the next generation in productivity measurement". Medical laboratory observer.
http://findarticles.com/p/articles/mi_m3230/is_n12_v25/ai_14863245 (12.9.2007)

Canada, National Hospital Productivity Improvement Program (1987): **Canadian workload measurement system- Laboratory.** Ministry of supply and services, Canada.

Canada, Canadian Institute of Health Information (CIHI) CD-ROM (2006): Workload Measurement System for Clinical Laboratories, Canada.

Canadian institute of health information (CIHI) (2007): how do you conduct a time study to determine a standard time for use within the workload measurement system of your organization.
http://www.cihi.ca/cihiweb/dispPage.jsp?cw_page=mis_faq_e#wms(26.10.2007)

Cartwright, R., Davies, J., Dulake, C., Hart, R., Morris, C., Wilkinson, P. (1985): "A study of workload units in five microbiology laboratories". Journal of Clinical Pathology, **38**. 208-214.

College of American Pathologists (CAP) (2006): Commission on Laboratory Accreditation; laboratory accreditation program: Transfusion Medicine Checklist. CAP. http://www.cap.org/apps/docs/laboratory_accreditation/checklists/transfusion_medicin_april2006.pdf (24.10.2007)

Daniel M. B., (1996): "How to solve problems using the labor-management partnership". Medical Laboratory Observer. http://findarticles.com/p/articles/mi_m3230/is_n7_v28/ai_18581093 (24 Oct. 2007)

Declaration of Almata (1978): International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978. http://www.paho.org/English/DD/PIN/alma-ata_declaration.htm (27.10.2007).

Director of laboratories and blood banks directorate (October 2007): Workload measurement and staffing decisions in Governmental PHC laboratories, Interview.

Garson, G.D. (1999): Reliability analysis. Statistics Solutions, Inc. http://www.statisticssolutions.com/reliability-analysis.htm (28.10.2007).

Gvazdinskas, L., Maffetone, M., (1995): "Employee satisfaction: and integral component of total quality". Clinical Laboratory Manage Rev., **9**. 107-112.

Heatherley, S., (2000): "Benchmarking laboratory operations". Clinical Laboratory Science. http://findarticles.com/p/articles/mi_qa3890/is_200007/ai_n8913017 (24 Oct. 2007)

Henry, J.B., (1991): **Clinical Diagnosis and Management by Laboratory Methods, 18th ed**. W.B. Saunders Company, USA.

Holt, D. H., (1987): **Management, principles and practices.** Englewood Cliffs, N.J.: Prentice-Hall. USA.

Houang, L., & EL-Nageh, M., (1993): **Principles of Management of Health Laboratories**. WHO, Alexandria

Isik, U. et al. (2007): "Deteriorated External Work Environment, Heavy Workload and Nurses' Job Satisfaction and Turnover Intention". Canadian Public Policy, **33**. 31-48.

Kosinski, D., & Klevinski, C., (1990): "A simple workload recording system that your entire staff can use". Medical laboratory observer, http://findarticles.com/p/articles/mi_m3230/is_n6_v22/ai_9108855

Lalonde, A., (1991-a): "The laboratory workload measurement system revisited- the MIS group". Canadian journal of medical technology, **53**. 123-124.

Lalonde, A., (1991-b): "The laboratory workload measurement system". Canadian Journal of medical technology, **53**. 204-106.

Lalonde, A., (1992): "Measuring and assessing productivity". Canadian journal of medical technology, **54**. 137-139.

Lalonde, A., (1993): "Statistics and indicators-A manager's best friends". Canadian journal of medical technology, **55**. 117-118.

Levin, K., (2006): "Study design III: Cross-sectional studies". Evidence-Based Dentistry, **7**, 24–25.

Lindler, V., & Champman S., (2003): The clinical laboratory workforce in California. UCSF Center for Health Professions. USA.

Lubbad, S. (2005): The effect of waste water treatment plant effluent (chemical quality) on underground water in Gaza City. Al-Quds University, Palestine.

Massroujeh, H., (2003): **Characteristic of laboratories in PHC Clinics-Gaza Strip. A Quality Manual**; MOH, Gaza.

McClatchey, K. D.(ed.) (1994): **Clinical Laboratory Medicine.** Williams & Wilkins. USA.

Palestine, Ministry of Health (1999-2003): **National Strategic Health Plan.** MOH, Palestine.

Palestine, Ministry of Health (2006): **Health status in Palestine: annual report 2005.** MOH, Gaza.

Palestine, Ministry of Health (2007): Palestinian Health Information Center: Map of Gaza Strip. MOH.

Palestine, Ministry of Health and European Commission (2004): Health Sector Review; Task Force 2: Health Sector Financing. MOH.

Palestinian Central Bureau of Statistics (PCBS) (2006): Demographic and Socioeconomic Status of the Palestinian People at the end of 2006. Ramallah - Palestine.

Robbins, S., (1998): **Organizational Behavior, 8th ed**. Prentice-Hall International, Inc., USA.

Schermerhorn, J., (1999): **Management, 6th ed.** John Wiley & Sons, Inc., USA.

Scott, M., (2006): "Assessing Performance, Productivity, and Staffing Needs in Pathology Groups: Observations From the College of American Pathologists Path Focus Pathology Practice Activity and Staffing Program". Arch Pathol Lab Med. **130**:1263-1268

Shipp, P.J., (1998): Workload Indicators of Staffing Needs (WISN): A manual for implementation. WHO, Geneva.

Smith, R., (2007): Early Warning Signs- Are Your Employees Losing Focus and Enthusiasm? http://www.californiachronicle.com/articles/ViewArticle.asp?articleID=34239 (15. Oct. 2007)

Thabet, S., (2004): Job satisfaction among managers working in Gaza hospitals. Al-Quds University, Palestine.

The Royal College of Pathologists (2005): Guidelines on staffing and workload for histopathology and cytology departments. Royal college of pathologists, London.

UNEP (2003). Desk study on the environment in the occupied Palestinian territories. Copyright c. UNEP, Geneva, Switzerland.

UNRWA (2006-a): Laboratory Productivity Sheet, (2006). UNRWA, Gaza.

UNRWA (2006-b): Laboratory Workload Units Sheet, (2006). UNRWA, Gaza.

Valenstein, P., Praestgaard, A., Lepoff, R. (2001): "Six-Year Trends in Productivity. and Utilization of 73 Clinical Laboratories". Archives of Pathology and Laboratory Medicine, **125**. 1153–1161.

Valenstein, P., Souers, R., Wilkinson, D., (2004): "Staffing benchmarks for clinical laboratories: A college of American pathologists Q-probes study of staffing at 151 institutions". Articles of Pathology and Laboratory Medicine, **129**. 467-473.

WHO, (1997): **Safety in Health-Care Laboratories**. WHO, Geneva.

WHO, (2003): Nursing and Midwifery Workforce Management: Conceptual Framework. WHO, India.

Wikipedia, The Free Encyclopedia (2007-a): Benchmarking. http://en.wikipedia.org/wiki/Benchmarking, (15.11.2007)

Wikipedia, The Free Encyclopedia (2007-b): Management. http://en.wikipedia.org/wiki/Management (24.Oct.2007)

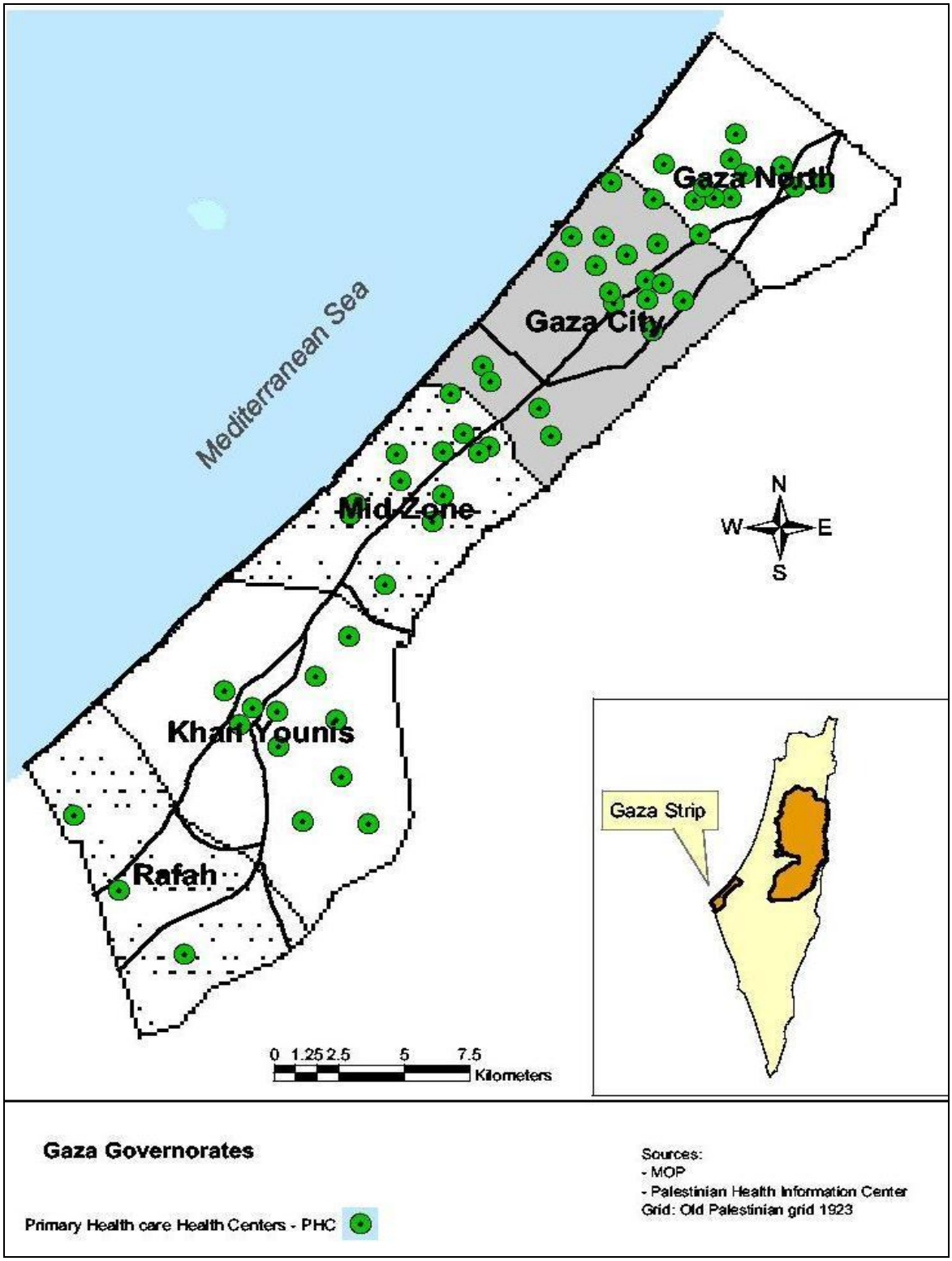
Wikipedia, The Free Encyclopedia (2007-c): Medical Laboratory. http://en.wikipedia.org/wiki/Medical_laboratory, (24.Oct.2007)

Wiktionary, The Free Encyclopedia (2007): Workload. http://en.wiktionary.org/wiki/workload (24.Oct.2007)

Yaffee, R.A., (1999): Common Correlation and Reliability Analysis with SPSS for Windows.http://www.nyu.edu/its/statistics/Docs/intracls.html (27.10.2007)

Annex 1

Map of Gaza Strip



Annex 2

Unit Values

UNRWA Laboratory Unit Values

Name of Test	Unit value/min	Name of Test	Unit value/min
Glucose	5	Brucella Test	6
Haemoglobin (Hb)	3	C-Reactive Protein (CRP)	6
Complete Blood Count (CBC)	2	Antistreptolysin O Titer (ASOT)	6
White Blood Cells	6	Rheumatoid Factor (RF)	6
Erythrocyte Sedimentation Rate	3	Urine Routine and Microscopy	9
Grouping and Rh Factor	4	Stool for Ova and Parasites	7
Pregnancy test	6		

Ref/ UNRWA Laboratory Workload Units Sheet, (2006).

College of American Pathologists (CAP) Unit Values

Name of Test	Unit value/min	Name of Test	Unit value/min
Haemoglobin (Hb) &HCT	8	Glucose	8
Complete Blood Count (CBC)	3	Pregnancy test	5
White Blood Cells & differentiation	11	Rheumatoid Factor (RF)	5
Erythrocyte Sedimentation Rate	4	Urine Routine and Microscopy	6

Ref/ (Henry, 1991).

Unit Values of the Canadian Workload Measurement System

Name of Test	Unit value	Name of Test	Unit value
Complete Blood Count (CBC)	3	Grouping and Rh Factor	4
White Blood Cells	6	Urine Routine and Microscopy	7
Erythrocyte Sedimentation Rate	4		

Ref/ Canadian Institute of Health Information CD-ROM, 2006.

Unit Values approved to be applicable in some countries of the Eastern Mediterranean Region

Name of Test	Unit value/min	Name of Test	Unit value/min
Glucose	8	Erythrocyte Sedimentation Rate	5
Haemoglobin (Hb)	5	Grouping and Rh Factor	9
White Blood Cells	6	Stool for Ova and Parasites	10

Ref/ Houang, L., EL-Nageh, M. WHO, 1993.

Annex 3

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

Date: 28/10//2007

التاريخ:٢٨/١٠/٢٠٠٧

Name: Reem Abu Shomar

الاسم: ريم أبو شومر

I would like to inform you that the committee has discussed your application about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

Workload Measurement in Governmental Primary Health Care Laboratories – Gaza Strip

In its meeting on October 2007
and decided the Following:-
To approve the above mention research study.

و ذلك في جلستها المنعقدة لشهر أكتوبر ٢٠٠٧
و قد قررت ما يلي:-
الموافقة على البحث المذكور عاليه.

Signature
توقيع

Ministry of Health Helsinki Committee

Member عضو

Member عضو

Chairperson عنه

Conditions:-

- Valid for 2 years from the date of approval to start.
- It is necessary to notify the committee in any change in the admitted study protocol.
- The committee appreciate receiving one copy of your final research when it is completed.

Gaza Etwam – Telefax 972-7-2878166

Annex 4

وزارة الصحة

كليـة الصحـة العامـة

School of Public Health

القدس ـ فلسطين

جامعة القدس

2007/4/10

الأخ/ د. علي قويدر المحترم

مدير عام الرعاية الأولية

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالبة ريم شومر

تقوم الطالبة المذكورة أعلاه بإجراء بحث بعنوان:

"Workload Measurement in Governmental primary health care laboratories-Gaza Strip"

كمتطلب للحصول على درجة الماجستير في الصحة العامة–مسار الإدارة الصحية علماً بأن الطالبة قد حصلت على موافقة لجنة هلسنكي لأخلاقيات البحوث و ستكون المعلومات متوفرة لدى الباحثة فقط. و عليه نرجو التكرم للإيعاز لمن ترونه مناسب لتسهيل مهمة الطالبة في جمع البيانات الخاصة.

موافقتكم دعماً للمسيرة الأكاديمية

و تفضلوا بقبول فائق الاحترام ،،،

د. سوزان شعشاعه

عميد كلية الصحة العامة المساعد

كلية الصحة العامة / غزة
رقم الصادر: 20
تاريخ الصدور: 2007/4/10

نسخة: الملف

Annex 5

كلية الصحة العامة

School of Public Health

فلسطين – القدس

جامعة القدس **وزارة الصحة**

INFORMED CONSENT FORM
نموذج الموافقة

العنوان: قياس حجم العمل في مختبرات الرعاية الأولية الطبية الحكومية بقطاع غزة

الباحث : ريم توفيق أبوِ شومر

سيقدم البحث كأطروحة لنيل درجة الماجستير في الصحة العامة – إدارة صحية التابع لجامعة القدس – أبو ديس.

الغرض:

يهدف البحث إلى تطوير قياس حجم العمل و تحديد وجهة نظر الموظفين في مختبرات الرعاية الأولية حول حجم العمل و بيئة العمل بالإضافة إلى قياس الوقت اللاز م لإجراء الفحوصات المخبرية مما سيساعد في توفير أداةٍ إداريةٍ خاصةً عند اتخاذِ قراراتٍ بخصوصِ عددِ و توزيعِ الموظفين.

الإجراءات:

يشمل البحث دراسة لحساب الوقت اللاز م لإجراء بعض الفحوصات و استبانه و نموذج تقييم حيث سيقوم أشخاص مدربين مستخدمين ساعة توقيتية بحساب الوقت اللاز م لإجراء بعض الفحوصات في مختبرات الرعاية الأولية ومن ثم ستقيم هذه النتائج.

أما الاستبانة فستستخدم لمعرفة وجهة نظر موظفي مختبرات الرعاية الأولية حول حجم العمل والقرارات المتخذة بشان عدد الموظفين و بيئة العمل.
سيعبئ الباحث نموذج التقييم لتكوين فكرة عامة عن الموظفين و بيئة العمل.

المنفعة

قد لا تعود عليك الدراسة بالمنفعة المباشرة لكن نتائج الدراسة قد تساهم في توفير أداةٍ إداريةٍ خاصةً عند اتخاذِ قراراتٍ بخصوصِ عددِ و توزيعِ الموظفين.

الاشتراك الطوعي:

الاشتراك في البحثِ طوعي ، فلك الحق في رَفْض المشاركة حتى إن قرّرت أن تكُون في الدراسةِ وغيرت رأيك فأنت تَمتلكُ حقّ الخُرُوج في أي وقت كان.

السريّة::

أوَدُّ أَنْ أُطمئِنَك بأنّ المعلومات سَتَكُونُ سرّية وسيتم تشفير الاستبانة، أما استخدام المعلومات فسيكون لأغراض علميةٍ فقط.

لمزيد من المعلومات حول هذه الدراسةِ، يمكنك الاتصال ب:
ريم توفيق أبو شومر
رقم الجوال

شكراً لتعاونِك

توقيعي يُشيرُ إلى موافقتي على المُشَارَكَة في هذه الدراسة

توقيع المشارك:---------- التاريخ:----------

قياس حجم العمل في مختبرات الرعاية الأولية الطبية الحكومية بقطاع غزة

استبانه

رقم الاستبانة:_____ التاريخ:_____

عزيزي الموظف/ ة :

نَشكر مشاركتك بوقتك الثمين في تعبئة هذا الاستبيان، فَهذه المشاركة ستساعد في إتمام دراستي حول قياس حجم العمل في مختبراتِ الرعاية الأولية الطبيةِ الحكوميةِ بقطاع غزة مما سيساعد في توفير أداةٍ إداريةٍ خاصةً عند اتخاذِ قراراتٍ بخصوصِ عددِ و توزيعِ الموظفين.

سَيقدمُ هذا البحث كَأُطروحةٍ لنيلِ درجة الماجستير في الصحة العامة – إدارة صحية التابعِ لجامعةِ القدس – أبو ديس.

اسم العيادة:_____ المدينة /القرية:_____
مستوى المختبر:_____ المحافظة:_____

أ- معلومات شخصية:

1. الجنس:
   O أُنثى O ذَكر
2. العُمر بالسنوات: _____
3. الحالة الاجتماعية:
   O متزوج O أعزب
4. المُؤهِل العلمي:
   O دبلوم O بكالوريوس
   O دبلوم عالي O ماجستير
5. التَخصص:
   O دبلوم فني مختبر "Medical Technician" O كيمياء حيوية "Biochemist"
   O بكالوريوس مختبرات طبية "Medical Technologist" O كيمياء "Chemist"
   O أحياء دقيقة "Microbiologist" O أحياء "Biologist"
   O غير ذلك. حدد_____
6. المُسمى الوظيفي:
   O فني مختبر O رئيس شعبة O مدير
   O مساعد معمل جامعي O رئيس قسم
7. الرَاتب بالشيكل: _____
8. سَنوات الخبرة في مجال المختبرات: _____
9. سَنوات الخبرة في مجال إدارة المختبرات: _____

ب. أجب عن هذه الأسئلة الخاصة بحجم العمل و عدد الموظفين

10. هَل سَبق أَن سَمعت بِالتعبير الإداري (حجم العمل) "Workload"؟ O نعم O لا

سَواءً كانت الإجابة بِنعم أَو لا، رجاءً أَجب عما يلي:

11. عَرف (حجم العمل) "Workload"

_____

_____

12. كَيف يُقاس (حجم العمل)" Workload"؟

_____

_____

13. هَل هناك معيار لقياس حجم العمل في مختبرك O نعم O لا O لا اعرف
"Workload measurement standard"؟

إذا كانت الإجابة بِنعم رجاءً أجب عن سؤال 15

14. عَلى ماذا يعتمد هذا المعيار؟ _____

15. هَل تلقيتَ أثناء دِراستك منهاجاً دراسياً بخصوص إدارة المختبرات؟ O نعم O لا

16. هَل تلقيتَ أَثناء عَملك أيَّ دوراتٍ تدريبيةٍ في مجالِ المختبرات؟ O نعم O لا

إذا كانت الإجابة بِنعم رَجاءً أجبْ عن الأسئلة 19، 18:

17. كم عدد هذه الدورات؟ _____

18. هَل كانت أَيٍ منْ هذهِ الدورات بخصوصِ إدارة المختبرات؟ O نعم O لا

إذا كانت الإجابة بنعم رجاءً أجبْ عن سؤال20:

19. كَم عدد هذه الدورات وما هو إجمالي مدتها: _____

مستنداً إلى تجربتِك في العمل، رجاءً أشرْ بعلامة X إلى رَدِّكَ على البياناتِ التالية:

	غير موافق	غير موافق	لا ادري	موافق	موافق بشدة

		بشدة				
	أهمية قياس حجم العمل:					
20.	يُعتبر قياس حجم العمل أمراً ضرورياً لإدارة المختبرات.	O	O	O	O	O
21.	يُعتبر قياس حجم العمل أمراً ضرورياً عند اتخاذ قرارات بشان عدد الموظفين و توزيعهم.	O	O	O	O	O
22.	*ليست هناك حاجة لوجود معيارٍ خاصٍ بقياس حجم العمل.*	O	O	O	O	O
	حجم العمل الحالي:					
23.	أعتقد أنني أُعاني من زيادة حجم العمل الملقاة على عاتقي.	O	O	O	O	O
24.	أعتقد أن زملائي في المختبر يعانون أيضا من زيادة حجم العمل.	O	O	O	O	O
25.	أعتقد أن زملائي في مختبرات الرعاية الأولية بو زارة الصحة يعانون أيضا من زيادة حجم العمل الملقى على عاتقهم.	O	O	O	O	O
	القرارات المتخذة بِشأن عدد و توزيع الموظفين:					
26.	القرارات المتخذة بِش أن عدد و توزيع الموظفين في مختبراتنا موضوعية.	O	O	O	O	O
27.	عدد الموظفين و توزيعهم في مختبراتنا عادل.	O	O	O	O	O
28.	القرارات المتخذة بشأن عدد و توزيع الموظفين في مختبراتنا شفافة.	O	O	O	O	O
29.	في مختبراتنا يعتمد اتخاذ القرار بشأن عدد و توزيع الموظفين على عدد الفحوصات التي يؤديها كل مختبر	O	O	O	O	O
	التواصل مع الإدارة:					
30.	يقوم مديري بإعلامي بخططه قبل أن يتخذ أيَّ قرارٍ بش أن عدد و توزيع الموظفين.	O	O	O	O	O
31.	يقوم المدير بإعطاء تفسير واضح للطريقة المستخدمة عند تحديد عدد وتوزيع الموظفين.	O	O	O	O	O
32.	يسمح لي مديري بمناقشة المواضيع الخاصة بعدد و توزيع الموظفين في مختبري.	O	O	O	O	O

33. هل تعاني من زيادة حجم العمل الملقى على عاتقك؟ O نعم O لا

إذا كانت الإجابة بنعم رجاءً أشر إلى السبب, في الأسئلة (34–46)
(يُمكنك الإشارة إلى أكثر من سبب)

34.	نقص الموظفين.	O نعم	O لا
35.	زيادة كثافة العمل.	O نعم	O لا
36.	تدريب موظفين جدد أو متدربين.	O نعم	O لا
37.	نقص بعض الموارد أو المحاليل الآلية.	O نعم	O لا
38.	زيادة العمل المكتبي (التسجيلات وإعداد الإحصائيات).	O نعم	O لا
39.	زيادة المهام الملقاة عليك.	O نعم	O لا
40.	الأعطال المتكررة للأجهزة.	O نعم	O لا
41.	بيئة العمل الغير مناسبة.	O نعم	O لا
42.	تَطبيق برنامج توكيد الجودة	O نعم	O لا
43.	تقصير زملائي في العمل واضطراري للتغطية إلى جانب عملي.	O نعم	O لا
44.	عدم وجود وصف وظيفي واضح.	O نعم	O لا
45.	عدم امتلاكي للمهارة الكافية لأداء العمل.	O نعم	O لا

46. إذا كان هناك سبباً آخرَ لشعورك بِزيادة حجم العمل الواقع عليك رجاءاً حدد:
_____

47. هَل هُناك كُتيب للسلامة في مختبرك؟ O نعم O لا O لا اعرف

48. هَل تَلقيت أَي دوراتٍ تدريبيةٍ بخصوص السلامة في المختبرات؟ O نعم O لا

إذا كانت الإجابة بنعم فأجب عن السؤال التالي:

49. كم عدد هذه الدورات وما هو إجمالي مدتها: _____

مستندا إلى تجربتِكِ في العمل، رجاءً أشرْ بعلامة X إلى رَدِّكَ على البياناتِ التالية:

		غير موافق بشدة	غير موافق	لا ادري	موافق	موافق بشدة
	بيئة العمل:					
50.	مكان عملي امن.	O	O	O	O	O
51.	مكان عملي صحي.	O	O	O	O	O
52.	*مكان عملي غير مريح.*	O	O	O	O	O
53.	مكان عملي نظيف.	O	O	O	O	O
54.	مكان عملي مكيف.	O	O	O	O	O
55.	مساحة المختبر مناسبة.	O	O	O	O	O
	صيانة الأجهزة:					
56.	عند استدعاء مهندس الصيانة لإصلاح أي عطل تكون الاستجابة سريعة.	O	O	O	O	O
57.	هناك صيانة دورية للأجهزة و المعدات في مختبري من قبل قسم الصيانة.	O	O	O	O	O
58.	الأجهزة والمعدات المستخدمة لإجراء الفحوصات في مختبري بحالة جيدة.	O	O	O	O	O

أُذكر أكثرَ ما يعجبك في مختبرك

_____

_____

_____

_____

_____

أُذكر أكثرَ ما لا يعجبك في مختبرك

_____

_____

_____

_____

_____

لَو كُنت المسئول في مختبرك ما هي القرارات(ذات الأولوية) التي ستتخذها؟

_____

_____

_____

_____

_____

_____

_____

_____

_____

وشكراً لتعاونكم

ريم أبو شومر

INFORMED CONSENT FORM

Title: Workload Measurement in Governmental Primary Health Care Medical Laboratories-Gaza Strip.

Investigator: Reem Tawfeek Abu S̩homar

This study is for the partial fulfillment of the master degree in public health –health management requirement from Al-Quds University, school of public health-Palestine.

Purpose:

The primary objective of this research will be to develop workload measurement in governmental medical laboratories, and once developed, it will serve as a management tool especially for staffing decisions.

Procedures:

This study will include a time study, a questionnaire, and a checklist; the time study survey will be conducted by a well trained technologist in different laboratories in which the surveyor will use a stop watch in order to time the procedure being done in the laboratory. The second is a staff questionnaire to examine employee perception of the existing workload, staffing level and working environment, the researcher will fill a check list to get general idea about the existing staff, and workplace environment.

Benefits:

There may be no direct benefit for you from taking part in this study. But the information from this study could help to improve work process through the development of workload measurement that helps in staffing decisions.

Voluntary participation/Withdrawal:

Participation in research is voluntary. You have the right to refuse to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time.

Confidentiality:

I would like to assure you that the information will be confidential and the questionnaire will be coded. The information will be used for scientific purpose.

In case you want to know more about this study, refer to Reem Tawfeek Abu Shomar ,
Mob No ……

Thank you for your cooperation

My signature below indicates that I agree to participate in this study.

Subject's Signature Date of Signature

---------- ----------

Workload Measurement in Governmental Primary Health Care Medical Laboratories – Gaza Strip

Staff questionnaire

Serial No. _____ Date:_____

Dear Participant:

Thank you for taking a few minutes to complete this form. Your help will assist in the accomplishment of my study about workload measurement in governmental primary health care medical laboratories.

This study is for the partial fulfillment of the master degree in public health – health management requirement from Al-Quds University, school of public health-Palestine.

Clinic:_____ City/village:_____

Laboratory Level: _____ Governorate:_____

A. Identifier:

1. Gender

   O Male O Female

2. Age/years: _____

3. Marital Status

   O Married O Single

4. Qualification:

   O Diploma O Bachelor
   O High Diploma O Master Degree

5. Specialty:

   O Medical Technologist O Chemist
   O Medical Technician O Biochemist
   O Microbiologist O Biologist
   O Others, specify
   _____

6. Job Title:

   O Lab Technician O Laboratory Assistance
   O Head of Branch O Head of Sector
   O Manager

7. Salary/NIS: _____

8. Experience Years in Field of Laboratories _____

9. Years of Managerial Experience _____

B. Now can you answer these questions about workload and staffing level

10. Have you ever heard about this managerial term "workload"? O Yes O No

    Whether the answer was yes or no please answer the following questions

11. What is workload?

    _____

    _____

    _____

12. How could workload be measured?

    _____

    _____

    _____

    _____

13. Is there a workload measurement standard in your laboratory? O Yes O No O Don't know

    If the answer is yes, please answer the following question if not go to question No. 15

14. What is this standard _____

15. Did you receive any courses about laboratory management during your college or university studies? O Yes O No

16. Did you receive any training courses in the field of laboratories? O Yes O No

    If the answer is yes please answer the following question, if not go to question No. 20

17. Number of these courses and duration _____

18. Did you receive any training courses about laboratory management? O Yes O No

    If the answer is yes please answer the following question, if not go to question No.20

19. Number of these courses and duration _____

Based on your experience at work, please indicate your response to the following statements:

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
	Managerial Essentiality					
20.	Workload measurement is essential for laboratory management.	O	O	O	O	O
21.	Workload measurement is essential for making decisions about staffing level and distribution.	O	O	O	O	O
22.	There is no need to have workload measurement standard.	O	O	O	O	O
	Existing Workload					
23.	Do you believe that you are work loaded	O	O	O	O	O
24.	Do you believe that other staff in your laboratory are work loaded	O	O	O	O	O
25.	Do you believe that other staff in other PHC laboratories are workloaded	O	O	O	O	O
	Staffing Decisions					
26.	Decisions about staffing level and distribution are made objectively in our laboratories.	O	O	O	O	O
27.	Staffing level and distribution in our laboratories is fair.	O	O	O	O	O
28.	Staffing level and distribution decisions are transparent.	O	O	O	O	O
29.	Staffing level and distribution based on the number of tests done by each laboratory	O	O	O	O	O
	Communication with Management					
30.	Before staffing decision, my manager informs us about his/her plans.	O	O	O	O	O
31.	When my manager makes a decision about staffing level or distribution, he/she gives explanations about the selection method used.	O	O	O	O	O
32.	I'm able to discuss staffing related issues with my manager.	O	O	O	O	O

33. Are you workloaded O Yes O No

If you are workloaded Please indicate to the factors that attributed to your over workload (you can point more than one factor)

34. Inadequate Staff	O Yes	O No
35. Additional job duties	O Yes	O No
36. Training of knew employees or trainees	O Yes	O No
37. Lack of resources (shortage in reagent supply)	O Yes	O No
38. Increasing paperwork	O Yes	O No
39. Increased Intensity of work	O Yes	O No
40. Frequent equipments failure	O Yes	O No
41. Improper working environment	O Yes	O No
42. Implementing QA program	O Yes	O No
43. Work Neglected by my colleges	O Yes	O No
44. Absence of clear job description	O Yes	O No
45. Lack of skills	O Yes	O No

46. If other things contributed to your over workload, please specify

_____

C. Now can you answer these questions about your laboratory environment

47. Is there a safety handbook in your laboratory? O Yes O No O Don't Know

48. Do you receive any training course about laboratory safety? O Yes O No

    If the answer is yes please answer the following question, if not go to question no.50

49. Number of courses you received and duration _____

Please indicate your response to the following statements

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
	Laboratory Environment:					
50.	My workplace is safe.	O	O	O	O	O
51.	My workplace is healthy.	O	O	O	O	O
52.	My workplace is uncomfortable.	O	O	O	O	O
53.	My workplace is clean.	O	O	O	O	O
54.	I'm working at a temperature-controlled workplace.	O	O	O	O	O
55.	My laboratory has sufficient working area.	O	O	O	O	O
	Maintenance of Instruments:					
56.	Engineers in the maintenance department respond rapidly upon their notification	O	O	O	O	O
57.	Equipments and instruments are regularly maintained by maintenance department	O	O	O	O	O
58.	Equipments and instruments in my department are in good condition.	O	O	O	O	O

Things you like in your laboratory:

_____
_____
_____
_____
_____
_____
_____

Things you dislike in your laboratory:

_____
_____
_____
_____
_____
_____
_____

If you were in charge what is your first priority decisions?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Thanks for your cooperation

Reem Abu Shomar

Annex 6

Observational Checklist

اسم المختبر: _____

مستوى المختبر: _____

مسئول المختبر: _____

تاريخ الزيارة: _____

عدد موظفي المختبر: _____

1. الموظفون:

رجاء تأكد من دقة المعلومات الواردة في القائمة التالية وأضف إن كان هناك أي نقص:

الرقم التسلسلي	الاسم	الجنس	المؤهل العلمي	التخصص	المسمى الوظيفي

2. الأجهزة:

أ. هل كتيب دليل التشغيل متوفر لكل جهاز؟ O نعم O لا

ب. هل هناك سجل خاص بصيانة و معايرة الأجهزة في المختبر؟ O نعم O لا

ج. قائمة الأجهزة:

رجاءً تأكد من دقة المعلومات الواردة في القائمة التالية وأضف إن كان هناك أي نقص:

الرقم التسلسلي	الأجهزة	الرقم	الحالة

3. الفحوصات المخبرية:

رجاءً تأكد من دقة المعلومات الواردة في القائمة التالية وأضف إن كان هناك أي نقص:

الرقم التسلسلي	اسم الفحص	الطريقة المتبعة	عدد الفحوصات

4. بيئة المختبر:

هل هناك مساحة كافية لكل من:

- منطقة ا لعمل O نعم O لا
- الأجهزة O نعم O لا
- التسجيل O نعم O لا

هل المختبر مكيف؟ O نعم O لا

هل هناك كتيب للسلامة في المختبر؟ O نعم O لا

هل هناك حاوية للتخلص من النفايات الطبية الحادة؟ O نعم O لا

هل يتم فصل النفايات الطبية عن العادية ؟ O نعم O لا

5. يعتمد نظام التسجيل على:

التسجيل اليدوي O نعم O لا

استخدام الحاسوب O نعم O لا

الطريقتين السابقتين معا O نعم O لا

6 التواصل مع إدارة المختبر:

بالمراسلات الرسمية O نعم O لا

مباشرة O نعم O لا

باستخدام التليفون O نعم O لا

باستخدام الفاكس O نعم O لا

باستخدام الجوال O نعم O لا

باستخدام الشبكة الالكترونية O نعم O لا

8. الملخص:

أدرج أهم المشاكل الملاحظة أثناء زيارتك للمختبر:

_____

_____

_____

_____

اسم الشخص الذي أتم تعبئة نموذج التقييم: _____

التوقيع: _____

التاريخ: _____

Observational Checklist

Laboratory:
_____
Level
_____
Laboratory Supervisor/Head of Laboratory:
_____
Date of Visit:
_____
Number of Lab Personals:
_____

1. Personnel:

Please check the following list for accuracy of the information about staff (if you have more please add):

S. no.	Name	Sex	Qualification	Specification	Job title

2. Instruments:

A. Does the lab have an operational manual for each instrument?

O Yes O No

B. Does the lab have records for instrument preventive maintenance?

O Yes O No

C. list of instruments:

Please check the following list for accuracy of the information about instrument: (if you have more please add)

S. no.	Name of the item	Catalogue no.	Condition

3. Laboratory examinations performed by laboratory: (if you have more please add)

S. No.	Name of the test	Method (if automated or manual)	Number of tests last /year

5- Laboratory environment:

Does the lab have sufficient area?

Working area O Yes O No

Recording area O Yes O No

Area for instruments O Yes O No

Is their an air condition?

O Yes O No

Is there a laboratory safety handbook?

O Yes O No

Is medical waste separated from domestic waste?

O Yes O No

Is there sharp boxes?

O Yes O No

6. Recording system:

O Manual

O Computerized

O Mixed

7. Communication:

O Direct
O Phone
O Fax
O Mob
O Net

8. On-Site Evaluation Summary

List any MAJOR problems identified during the on-site visit:

Name of person completing On-Site Evaluation:
_____

Signature: _____ Date_____

Annex 7

Extraction Sheet

Laboratory:---------- Date:----------

Observed Time for Each Procedure (test):

Date	Test Name	Method	Instruments Used	Step	Observed time	Technologist Name

Annex 8

Annual Number of Cases and Tests by each PHC Laboratory.

Lab. Name	Governorate	Lab. Level	No. of Staff	No. of cases	Case/Employee	No. of Tests	Test/Employee
Al-Remal	Gaza	4	15	48,742	3,249	145,930	9,729
Al-Sheek Radwan	Gaza	3	3	9,162	3,054	15,239	5,080
AL-Shate'	Gaza	3	2	5,952	2,976	5,900	2,950
Al-Daraj	Gaza	3	3	9,474	3,158	14,417	4,806
Al-Zaytoon	Gaza	3	3	13,527	4,509	17,146	5,715
Ata Habeeb	Gaza	2	1	3,546	3,546	4,226	4,226
Sabha Al Harazeen	Gaza	3	2	13,763	6,882	21,346	10,673
Al-Sorani	Gaza	3	3	17,851	5,950	25,581	8,527
Al-Rahma	Gaza	3	3	12,480	4,160	21,036	7,012
Al-Falah	Gaza	2	2	4,030	2,015	5,499	2,750
Jabalia	North	4	4	14,591	3,648	30,744	7,686
Beet Lahia	North	3	2	7,698	8,300	14,935	7,468
Abu Shbak	North	3	1	8,300	3,849	12,230	12,230
Al-Atatra	North	2	1	1,403	1,403	2,169	2,169
Beet Hanoon	North	3	2	4,877	2,439	10,128	5,064
Deer El Balah	Midzone	4	3	14,795	4,932	27,497	9,166
Al-Zawaida	Midzone	2	1	2,343	2,343	3,806	3,806
Al-Kawalda	Midzone	2	1	705	705	1,333	1,333
Al-Moghraka	Midzone	2	1	904	904	1,166	1,166
Al-Maghazi	Midzone	2	1	1,567	1,567	3,473	3,473
Al-Buriej	Midzone	2	1	1,632	1,632	2,724	2,724
Al-Nusierat	Midzone	3	3	3,609	1,203	8,447	2,816
Western Nusierat	Midzone	2	1	1,815	1,815	3,095	3,095
Wadi AL Salka	Midzone	2	1	2,582	2,582	4,711	4,711
Khanunis	Khanunis	4	6	17,010	2,835	24,583	4,097
Bani Suhila	Khanunis	3	3	6,283	2,094	9,397	3,132
Al-karara	Khanunis	3	2	7,637	3,819	11,050	5,525
Abasan EL Jadeda	Khanunis	2	1	2,347	2,347	2,750	2,750
Abasan EL Kabera	Khanunis	2	3	5,690	1,897	9,420	3,140
Rafah	Rafah	4	5	27,665	5,533	47,418	9,484
Tal El Sultan	Rafah	3	3	9,334	3,111	13,435	4,478
Al-Shoka	Rafah	2	1	2,400	2,400	2,949	2,949
Total			84				

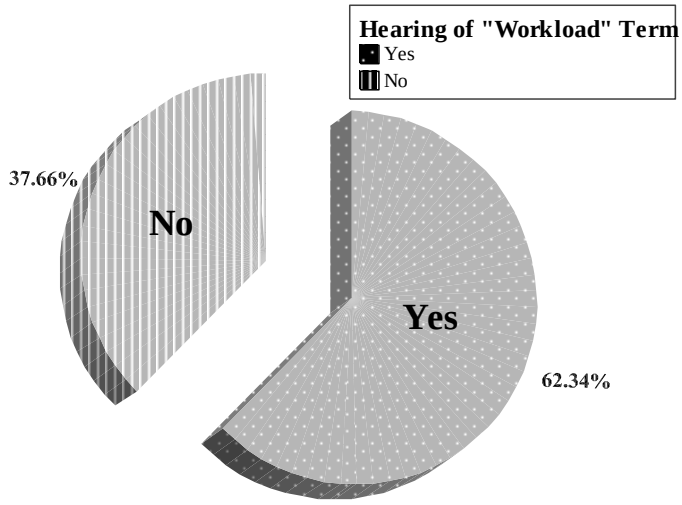
Annex 9

Instrument Related Items

Item	Frequency	Percentage (%)
Availability of Maintenance Records		
Yes	27	84.4
No	5	15.6
Total	32	100
Availability of Operation Manual for each Instrument		
Yes	5	15.6
No	27	84.4
Total	32	100
Disrupted Instruments		
No disrupted instrument found	16	50
One or more than one disrupted instrument	16	50
Total	32	100

Annex 10

Employees Knowledge of Workload



Hearing about "Workload" Term.

Workload Definition by Laboratory Employees

Workload Definition	Frequency	Percentage (%)
The sum of work achieved or to be achieved	22	30.6
The number of cases or tests performed	37	51.4
Others	13	18.0
Total	72	100.0

Annex 11

Employees' Questionnaire Results

Survey Question	Strongly Agree		Agree		Neither agree nor disagree		Disagree		Strongly disagree	
	n	%	n	%	n	%	n	%	n	%
Managerial Essentiality of Workload Measurement										
Workload measurement is essential for laboratory management.	29	35.8	50	61.7	1	1.2	0	0	1	1.2
Workload measurement is essential for making decisions about staffing level and distribution.	36	44.4	44	54.3	0	0	0	0	1	1.2
There is a need to have workload measurement standard.	27	33.3	41	50.6	10	12.3	1	1.2	2	2.5
Existing workload										
I am workloaded	11	13.6	32	39.5	4	4.9	29	35.8	5	6.2
Other staff in my laboratory are work loaded	12	14.8	30	37.0	14	17.3	22	27.2	3	3.7
Other staff in other PHC laboratories are workloaded	12	14.8	28	34.6	22	27.2	16	19.8	3	3.7
Staffing and staffing decision										
Staffing decisions about staffing level and distribution are made objectively in my laboratory	4	4.9	32	39.5	11	13.6	23	28.4	11	13.6
Staffing level and distribution in my laboratory is fair.	2	2.5	21	25.9	10	12.3	34	42	14	17.3
Staffing level and distribution decisions are transparent**.**	3	3.7	22	27.2	22	27.2	24	29.6	10	12.3
Communication with management										
Before staffing decision, my manager informs us about his/her plans.	1	1.2	20	24.7	12	14.8	25	30.9	23	28.4
When my manager makes a decision about staffing level or distribution, he/she gives explanations about the selection method used.	2	2.5	25	30.9	9	11.1	27	33.3	18	22.2
I'm able to discuss staffing related issues with my manager.	1	1.2	36	44.4	6	7.4	22	27.2	16	19.8
Working environment										
My workplace is safe.	0	0	29	35.8	8	9.9	32	39.5	12	14.8
My workplace is healthy.	1	1.2	24	29.6	5	6.2	38	46.9	13	16
My workplace is comfortable.	6	7.4	32	39.5	2	2.5	27	33.3	14	17.3
My workplace is clean.	8	9.9	48	59.3	0	0	20	24.7	5	6.2
My laboratory has sufficient area.	3	3.7	22	27.2	1	1.2	25	30.9	30	37
Equipment maintenance										
Equipments and instruments are regularly maintained by maintenance department.	0	0	3	3.7	7	8.6	38	46.9	33	40.8
There is a rapid respond form the maintenance department upon their notification	1	1.2	9	11.1	2	2.5	43	53.1	26	32.1

Annex 11
continued

Staffing Decisions about Staffing Level and Distribution Based on Number of Tests

Employees' Answers	Frequency	Percent
Agree	37	45.7
Disagree	28	34.6
Neither agree nor disagree	16	19.8
Total	81	100.0