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Knowledge, Attitude and Practice of Primary School Teachers about Water Pollution in Khanyounis Governorate

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Dedication

I dedicate this work to my husband … Without his understanding, support and encouragement this thesis would not be completed.

Lots of thanks and love to my father, my mother, my sisters, especially Mona and brothers who never stopped encouraging me.

Maysa Abu Mousa

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First of all, praise and gratitude be given to Allah the almighty for giving me such a great strength, patience, courage and ability to complete this research, and peace and blessings of Allah be upon the noblest of all Prophets and messengers, our prophet Muhammad, all thanks for Allah who granted me the power and capability to complete this thesis.

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Maysa Abu Mousa

July, 2011

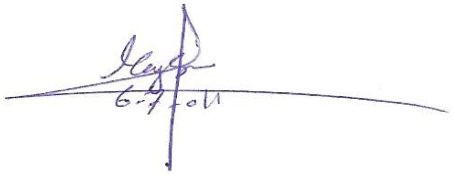
Declaration

I declare that this research is my own work and that no part of it has been copied from any other previous works on the subject, except in such instances where acknowledgment has been duly made.

Signature

Maysa

Date 6/7/2011



Abstract

This study aimed to determine the level of KAP regarding water pollution among primary school teachers in Khanyounis governorate. The sample of the study consisted of 330 primary school teachers (208 from UNRWA and 122 from governmental primary schools) chosen from the assigned 15 schools. For data collection, the researcher used constructed, self-administered questionnaire. For data analysis, the researcher used frequencies, means, percentage, t- test, one-way ANOVA and Pearson correlation test. The results of the study showed that generally the percentage of knowledge regarding water pollution was 81.7% among the teachers, the vast majority of study participants have knowledge about water pollution and its harmful effects on human being. Among study participants, 95.8% were found to have knowledge regarding water pollution, 95.2% believe that waste water is one of the sources of water pollution and 99.4% knew that polluted water can cause diseases to humans. Also, the results showed that 72.4% of study participants have some knowledge about environmental sciences, 65.8% considered environmental education as part of school curriculum and 43.3% of study participants related water pollution to lack of community awareness. Regarding attitudes, the mean percentage of the total scores for those who responded by (agree) on the attitudes scale items was 80.41. Also, 90.9% believe that mixing of sewage with groundwater must be reduced, 92.4% believed that water pollution can be reduced, 85.8% believed that quality of water can be improved by using filtration methods, 97.2% believed that legislations to control water pollution should be enacted and 98.8% believed that awareness of students regarding water pollution should be increased. Regarding participation in health educations sessions, only 17.9% participated health education sessions, of them 21.5% related that to absence of educational activities, 3.9% were not interested and 56.7% were not invited to attend any educational sessions. Also, 84.5% did not have any practical training regarding water pollution sources and control.
Female teachers have better practices about water pollution compared to male teachers.
There were no significant differences in knowledge, attitudes and practices toward water pollution between UNRWA and government school teachers. There were no significant differences in knowledge and attitudes toward water pollution related to age of the teacher, but differences were significant in practice, age group (20 – 30) years have better practices toward water pollution compared to other age groups. Also, there were no significant differences in knowledge and attitudes toward water pollution related to years of experience, but differences were significant in practice in favor of teachers who have less than 5 years of experience. There were no significant differences in knowledge, attitudes and practice toward water pollution between teachers with different qualifications. In conclusion, the results revealed high level of knowledge and attitudes, but low level of practice regarding water pollution. These results should stimulate some activities to raise the level of awareness toward environment through formal and informal educational programs.

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List of Abbreviations

EPA	Environment Protection Agency
EQA	Environment Quality Authority
GS	Gaza Strip
KAP	Knowledge, Attitudes and Practice
MOH	Ministry of Health
NGOs	Non-governmental Organizations
NPDWS	National Primary Drinking Water Standards
NPS	Non Point Source
ORP	Oxygen Reduction Potential
PCBS	Palestinian Central Bureau of Statistics
PPT	Parts Per Thousand
PSS	Practical Salinity Scale
PWA	Palestinian Water Authority
SPSS	Statistical Package for Social Sciences
UN	United Nations
UNEP	United Nations Environment Program
UNRWA	United Nation Relief and Work Agency for Palestinian Refugees
WB	West Bank
WHO	World Health Organization
WWTP	Waste Water Treatment Plants

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Chapter One

1.1 Introduction

Environmental issues became one of the major topics for discussion and analysis nowadays in the industrial societies. Recent studies reported general deterioration of environmental conditions, escalating environmental degradation includes deforestation, loss of biodiversity, ozone depletion, global climate change, pollution and over-consumption of natural resources which directly impact our ability to develop economically, while at the same time sustaining the health of people as well as plants and animals (Kibert, 2000; Vadala, 2004). Along with exponential population growth, these problems are especially significant in developing countries (Vadala, 2004). The United Nations Environment Program (UNEP) reported "in the Palestinian territories, environment is facing serious threats, such as high population growth, limitation of land resources, long term isolation as a result of the regional political circumstances and the underdeveloped environmental protection system which caused serious deterioration, fast depletion and contamination of environmental resources that, in turn, lead to health hazards among citizens" (UNEP, 2003).

Water is fundamental to all forms of life on earth, without clean water, we cannot experience optimum health, or lead normal lives (WHO, 1993). All people whatever their stage of development and social and economic condition, have the right to have access to drinking water in quantities and of quality equal to their basic needs (UN, 1977). Water and sanitation is one of the primary drivers of public health. One often refer to it as "Health 101", which means that once we can secure access to clean water and to adequate sanitation facilities for all people irrespective of the difference in their living condition, a

huge battle against all kinds of diseases will be won" (WHO, 1993). More than 10% people in the world (more than 900 million people) suffer from lack access to water that is safe for drinking and almost three times that (more than 2.5 billion people) live without adequate sanitation systems which lead to many diseases. And as the population on earth increases so do these numbers.

Groundwater is so far the largest source of water for the people of Palestine. Already the water availability for Palestinians has been decreasing to the low average of 25-30m^3 per year per capita –some studies show the water deficit to be in the range of 50 MCH\yr in Gaza strip (GS) and approximately 70 MCM\ yr in the West Bank (WB). The principal water resources available to Palestinians include groundwater, springs and harvested rainwater (Sarsuor, 2007).

Palestinian Water Authority (PWA) mentioned that fresh ground water resources are currently being depleted due to over pumping of the aquifer, the fact that rates of salinization are increasing in areas of relatively good water quality implies that fresh water bodies are gradually becoming replaced with brackish and/or saline water. The time frame until all fresh water resources are exhausted will depend on continued pumping volumes and patterns, as well as the balance between aquifer inflows and out flows. Using a rate of aquifer depletion of 20 MCM/y, it can be calculated that in theory, it will take about 20-30 years before all the fresh water in the Gaza coastal aquifer is replaced with higher salinity water (PWA, 2000).

Pollution of groundwater in GS is a major problem. Not only there are numerous sources of pollution, but also the aquifer is highly vulnerable to pollution. Many years of over pumping have resulted in the seawater intrusion and up coning of saline ground water. Furthermore, human activities including agriculture and inadequate waste management have increased groundwater contamination level. The high nitrate content of the

groundwater appears to be primarily induced by sewage and solid waste. The reason for drawing attention to nitrate pollution is its toxicity to humans, especially for babies and pregnant women by the so-called "blue babies" syndrome. Another factor which affects groundwater is the salinity content which has shown an obvious increase during the past 10 to 20 years, this may be the result of groundwater flow from the east, salinization of the surface, and seawater intrusion from the west (PWA, 1999).

Water pollution is a major problem in the global context. It has been suggested that it is the leading worldwide cause of deaths and diseases. Diarrhea is the most common disease associated with contaminated water and worldwide it accounts for the deaths of more than 14,000 people daily. An estimated 700 million Indians have no access to a proper toilet, and in India alone, there are more than a million child deaths per year resulting from waterborne diseases like diarrhea. Nearly 500 million people lack access to safe drinking water in developing countries. The World Health Organization (WHO, 2002) estimate of those 1.7 million deaths and 54.2 million disability adjusted life years (DALYs) are lost worldwide per year due to unsafe water, hygiene and sanitation.

According to Abu Safieh (2006), environmental awareness and education are important means for preserving and protection the environment, based on adjusting attitude and supporting positive behaviors toward the environment. Abu Safieh added that, nevertheless environment in the occupied Palestinian territory is vulnerable, taking into consideration the exposure to the occupation measures; confiscation of land, intensification of the unjust distribution of resource between Palestinian and Israelis, and as many reports indicate dumping the Palestinian areas with settlements, solid waste and liquid wastes. The pollution and rapid urbanization of Palestinian cities, mainly due to restriction on normal growth of Palestinian urban areas and lack of law enforcement in the Palestinian

jurisdictions, importantly justify the pressing need for environmental awareness within the Palestinian society.

Environmental education aims to produce an environmentally literate citizen with basic skills of awareness, knowledge, and concern for the environment (Fien, 1988). Research studies show that increased awareness and knowledge of individual as well as global environmental action strategies contribute to increased student motivation to make action (Palmberg and Kuru, 2000).

Khanyounis is one of GS cities that suffer from water pollution problems. Its source of drinking water depends on desalinated water and ground water and its sewage system depends mainly on septic tanks and cesspits. The wastewater collection basins are near Al Mawasi which is characterized by its shallow groundwater aquifer and it is anticipated that it will be completely damaged. It is believed that a sewage water pipe line will be constructed to convey the waste water collected in those basins directly into the marine environment which will add to the already existing severe pollution.

1.2 Research Problem

The GS, as one of the most highly populated areas on earth, has been facing a very complicated water problem of both the rapid decrease of the water quantity and the rapid deterioration of its quality. This ultimately has lead to the increase of the water-borne and water associated diseases among the economically destroyed population. The first step towards avoiding and mitigating the negative health impacts of such situations is the people's awareness of the kind and the magnitude of the problem. The awareness of the school children of the water problem is an essential tool towards reducing the water problem and its direct and indirect health impacts on the society. The primary and main point of the awareness of the students about water pollution begins from their teachers'

awareness and knowledge which are reflected on their attitude and practice. So, this study aims to determine level of knowledge, attitude and practice (KAP) regarding water pollution among primary school teachers in relation to some demographic variables.

1.3 Justification of the Study

Based on the demographic status of GS where population growth is very high, estimated population of GS is about 1.6 million persons, coupled with limited land is considered one of the highest densely populated areas in the world (4,073 persons/km^2) (PCBS, 2009).

Water is one of the main sources for the continuation of life, so it is needed for the maintenance of the life. So, for this continuation the awareness of the community and the family, especial the children in primary school period should be taken care of, and hence the awareness of their teachers. So, the focus of this study will be on the evaluation of the awareness degree of primary school teachers about water pollution. The main summarized reasons for the selection of this topic include the following.

There is a lack of information on the knowledge, attitudes and practices about water pollution management among primary school teachers in Khanyounis governorate.

Highlighting the importance of water pollution management for public health community, and the environment is needed to mitigate health hazards associated with mismanagement of polluted water. In order to make the awareness about water pollution among primary school teachers more broad and to maintain the resources of water more efficient and clean, standardizing the knowledge, attitude and practice among teachers in their universities and how to improve current attitude among them are of real importance.

Also, human intervention is very important to reduce the rapid deterioration of the water quantity and quality in the whole of GS in general and in Khanyounis in particular. So, on top of the means to achieve this, awareness of the people is an important tool. Awareness

must originate from schools to children, and this can only be achieved by the teachers who should be informed and knowledgeable about water. So, to set special programs to increase the teachers' awareness, an evaluation of their current awareness status must be performed.

1.4 Main Objective of the Study

The main objective of this study is to determine the level of KAP regarding water pollution among primary school teachers in Khanyounis governorate.

1.4.1 Specific Objectives

- To examine the level of KAP among primary school teachers in Khanyounis governorate regarding water pollution.
- To identify the differences in KAP between UNRWA and government primary school teachers.
- To determine the differences in KAP among primary school teachers related to sociodemographic variables including (age, gender, years of experience and qualification).
- To suggest recommendation that may help to improve the awareness among teachers.

1.5 Research Questions

- What is the level of knowledge, attitude and practice regarding water pollution among primary school teachers in Khanyounis?
- Are there significant differences in KAP regarding water pollution between governmental and UNRWA primary school teachers?

- Are there significant differences in KAP regarding water pollution related to teacher's age?
- Are there significant differences in KAP regarding water pollution between male and female teachers?
- Are there significant differences in KAP regarding water pollution related to teachers' years of experience?
- Are there significant differences in KAP regarding water pollution related to teachers' qualification?

1.6 Context of the Study

1.6.1 Demographic context

Palestine is a very small country, approximately 27,000 Km^2, has an important location in Western Asia, it is bordered from the west by the Mediterranean, from the east by Syria, and Jordan, from the north by Lebanon and on the south by the Sinai desert and the Gulf of Aqaba (MOH, 2006).

Palestine, because of its strategic location, has been exposed to many invasions and occupations throughout history. Nowadays, what is left of Palestine after the criminal creation of Israel in 1948 is separated geographically into two entities, the West Bank and Gaza Strip, which is a very highly populated area.

The territory of Palestine covers around 10,435 square miles out of this territory; there is about 10,163 square miles of land area. The population size of Palestinians in WB and GS was estimated at about 3,761,646 in 2007, the population size of GS was about 1,416,539 in 2007 and about 2,345,107 in WB (PCBS, 2009).

This large number of population in the small surface area with this density creates a worried health, environmental and economical problems. Most of the Palestinian

population is under the age of 15 years which represents 46.3% of the total population in Palestine. The percentage of Palestinians who are older than 65 years is 2.8%. This makes the Palestinian population a young population which in turn creates an economic burden. The median age in Palestine has increased from 16.4 years in 1997 to 16.7 years in 2004. The natural population increase rate in Palestine is estimated at about 3.3%, with 3.8% in Gaza strip (MOH, 2006).

1.6.2 Gaza Strip

GS is located in an arid area with scarce water resources. It is a part of Palestine coastal plain in the south west of Palestine, where it forms a long and narrow rectangular area of about 378 km2, with 45km length, and between 5 and 12km width. Normally, its five governorates are Northern Gaza, Gaza, Middle, Khanyounis and Rafah. It is located on the south-eastern coast of the Mediterranean Sea between longitudes 34 2`` and 34 25`` east, and latitudes 31 16`` and 31 45`` north. The Gaza Strip is confined between the Mediterranean Sea in the west, Egypt in the south. Before 1948, it was part of Palestine under the British Mandate. From 1948 to 1967, it was under the Egyptian administration. From 1967 until 1994, the GS was under Israel occupation. According to the peace agreement between Israel and the Palestinian liberation organization (PLO), the GS has been under the Palestinian Authority control since May 1994.

Gaza coastal aquifer is an important source of water to over 1.6 million residents in GS. It is utilized extensively to satisfy agricultural, domestic, and industrial water demands. The extraction of groundwater currently exceeds the aquifer recharge rate. Today, the GS is a land under great pressure. It is densely populated, with population of more than one million in the year of 1998 and the population increased rapidly up to approximately 1.5 million in 2007, which means that the environment in Gaza has been under great pressure and as a

result most of the people there suffers severely now. Khanyounis Governorate is located in the southern part of Gaza Strip. Its district capital is Khanyounis city. The Khanyounis governorate consists of six municipalities: Khanyounis, Bani Suhaila, Abasan El-Kabira, Abasan El-Saghira, Quarrara, Al Fakhari and the Khuza'a.

1.6.3 Physical Setting of Khanyounis Governorate

Khanyounis Governorate is a part of the GS. It is located in the south of the Gaza Strip, bound by Deir al Balah to the north (9 km distance between Khanyounis and Deir al Balah city) and Rafah in the south (9 km distance between Khanyounis and Rafah cities). It covers an area of about 111 km2 (about 31% of the GS total area). According to the Palestinian Central Bureau of Statistics (PCBS, 2008), the population of Khanyounis in 2007 was 270,979 inhabitants (about 19.1% of the GS total population).

The built-up area occupies an area of about 17.57 squared Km, the agricultural lands cover an area of about 63 squared Km. The area is generally flat with topographic elevation ranging from mean sea level in the west to about 100m above MSL in the east. There is a five month period in winter (November-March) with a rainfall surplus. The rest of the year, evaporation greatly exceeds the rainfall. The annual average rainfall in the Governorate is more than 300mm. On an average there are less than 30 rainy days in the year. The aquifer of Khanyounis is a part of the GS Pleistocene coastal aquifer. Its average thickness ranges from 60 m in the east to about 140 m at the coastline. The aquifer is mainly composed of gravel, calcareous sandstone, clay and unconsolidated sands (sand dunes). Near the coast, coastal clays extend about 2-4 km inland, and divide the aquifer sequence into three subaquifers (A, B and C). Towards the east, the clay pinch out and the aquifer is largely unconfined (PWA, 2001). In fact, the natural conditions (Unconfined condition and shallow water table near the coast) allow the entry of contaminants

through the surface. So, the groundwater vulnerability will be evaluated for the Pleistocene aquifer. This aquifer represents the most important water bearing formation.

1.6.4 Description of the Coastal Aquifer

The coastal aquifer of the GS (including Khanyounis governorate) is part of a regional groundwater aquifer system that extends north up to Haifa, and south into Sinai coast of Egypt. The coastal aquifer consists primarily of Pleistocene age Kurkar Group deposits including calcareous and silty sandstones, silts, clays, unconsolidated sands, and conglomerates. The coastal aquifer is generally 10-15km wide; the Kurkar group forms a seaward sloping plain, which ranges in thickness from 0 m in the east, and about 100 m at the shore in the south, and about 200m near Gaza city. At the eastern Gaza border, the saturated thickness is about 60-70m in north, and only a few meters in the south near Rafah. Near the coast, coastal clay layers extend about 2- km inland, and divide the main aquifer into three sub-aquifers. The base of the aquifer is marked by the top of Saqiya formation (Tertiary age), it is a think sequence of marls, clay stones and shale that slopes towards the sea, with low permeability and approximately 400-1000m thick wedge beneath the GS (PWA, 2000).

1.6.5 Groundwater Flow and Water Levels

Under natural conditions, groundwater flow in the Khanyounis governorate is towards the Mediterranean Sea, where fresh groundwater discharges to the sea. However, natural flow patterns have been significantly disturbed by increasing population and over pumping in the past 40 years. Within the Khanyounis governorate, large cone of depression has formed over large area. Water levels are presently below mean sea level in many places, inducing a hydraulic gradient from the Mediterranean Sea towards the major pumping centers and

municipal supply wells. In Khanyounis, water levels rang from about 10 meters above sea level near the eastern border to mean sea level along the shore. In some places, flow directions have been reversed as a result of over-pumping (PWA, 2000).

1.7 Definition of Terms

Knowledge

The way to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of the environment and its associated problems (Bell, 2009).

The researcher defines knowledge operationally as the total scores gained by study participants on knowledge questionnaire.

Attitude

The way to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection (UNESCO and UNEP, 1995).

The researcher defines attitude as the total scores gained by study participants on the attitude scale.

Practice

Tbilisi Declaration 1977 defined practice as "The way to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems" (www. enviwiki. accessed 2.3.2011).

The researcher defines practice operationally as the total scores gained by study participants on practice questionnaire.

Water pollution

Water pollution is defined as "The presence of any material in the water that is harmful to plants, animals and humans, or affects its taste and odor, or detracts from any use that can be made of it" (wiki.answers.com, 2011).

Primary School Teachers

The researcher defines primary school teacher as, every teacher employed at UNRWA or governmental primary school in Khanyounis governorate during the academic year 2010/2011.

1.8 Layout of the Study

This study consists of five chapters: introduction, conceptual framework and literature review, methodology, results and discussion, conclusion and recommendations.

The first chapter browsed general introduction to the study, where a brief background regarding the subject of the study was provided. The researcher illustrated the research problem, justification for conducting the study, the main and specific objectives, research questions, definition of terms and context of the study.

The second chapter included two parts: the first part is conceptual framework where the researcher provided a schematic diagram of the conceptual framework of the study. The second part is the literature review related to the study topic and variables. In-depth detailed theoretical inquiry including previous studies was presented to enrich the study.

The third chapter described methodology including study design, population, sample, instruments, pilot study including validity and reliability of study instruments, ethical considerations, and statistical analysis.

The fourth chapter presented the study results and discussion. The researcher treated the results in form of tables that make it easy for the reader to understand and make comments. The results were discussed in respect to available published previous studies that directly related to the topic of this study and its objectives.

Finally, in the fifth chapter, the researcher presented conclusion and recommendations in the light of the study results.

Chapter Two

Conceptual Framework and Literature Review

2.1 Conceptual Framework

The conceptual framework is the map that guides the design and the implementation of the study and its mechanism for illustration and summarizing the study variables. It was designed by the researcher based on review of available literature and previous studies. There are different factors that affect the teachers' knowledge and awareness, such as school, media, family and environmental clubs. Also, from the evidence of literature reviewed, environmental knowledge, attitude and practice may be influenced by gender, qualification and years of experience.

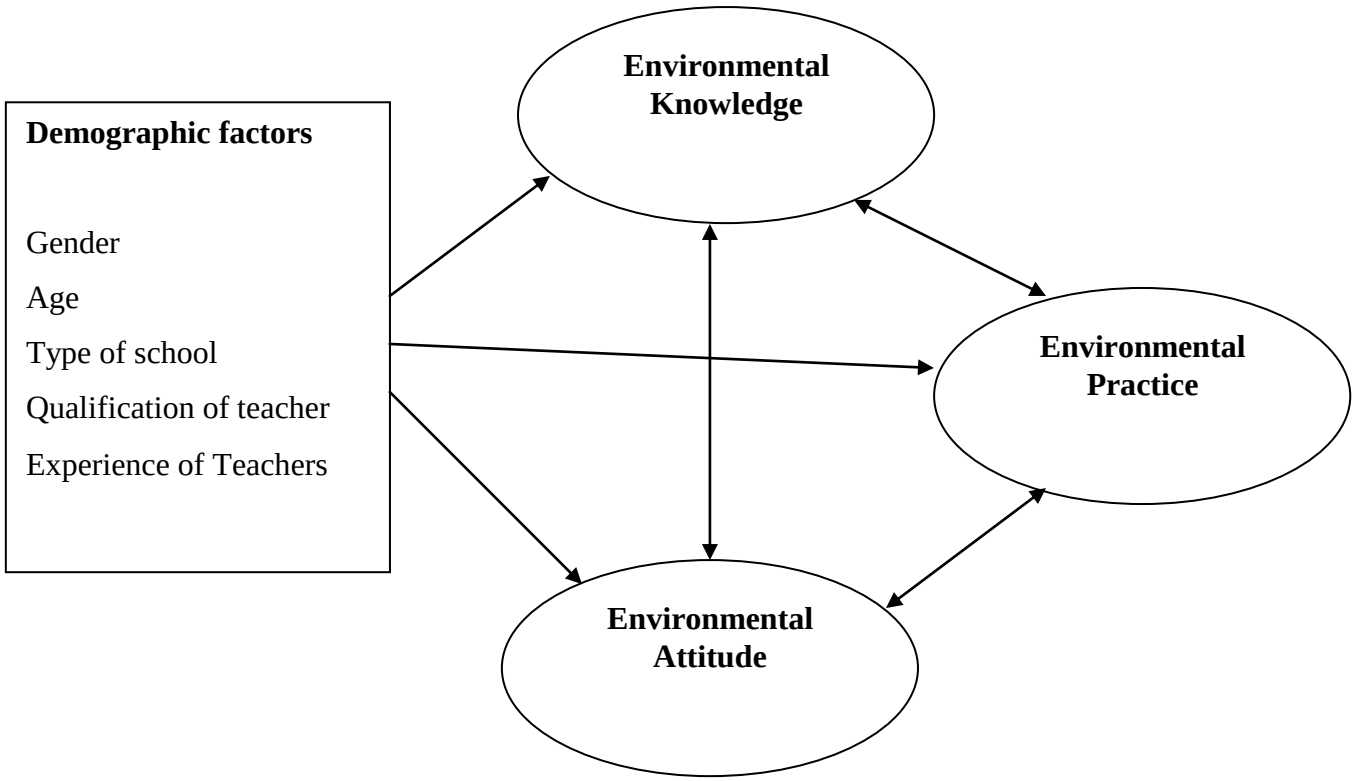

Figure 2.1: Diagram of Conceptual Framework

2.2 Literature Review

Palestine is experiencing a severe water crisis caused mainly by the lack of control over the Palestinian water resources. At present the average per capita water consumption by the Palestinian population is approximately 55 l/c/d, or 55% of the WHO minimum standard of 100 l/c/d. The GS aquifer, while it is part of the coastal aquifer, has been continuously over-pumped for quite some time in large part to serve the high population. In addition, Israel has been tapping this aquifer and its replenishment from outside GS. Most water resources experts agree upon the severe crisis of the water situation in the GS. The water table has been pumped to far below the recharge rate, and there is evidence of deteriorated water quality of the aquifer (Abu Zahra, 2000).

2.2.1 Water Pollution Categories

Point Source Pollution

It refers to the contaminants that enter a waterway through a discrete conveyance. Examples of sources in this category include discharges from a sewage treatment plant, a factory, or a city storm drain.

Non-point Source Pollution

It refers to the contamination that does not originate from a single discrete source. For example urban runoff non point source pollution, or polluted runoff, has historically received less emphasis than point source pollution, government programs are gaining momentum to address this substantial source of water pollution. Staff at the State Water Resources Control Board (SWRCB) indicated that non point source pollution is the major remaining cause of impairment to the State's waters. The SWRCB's 1988 Water Quality Assessment Report states, "non point pollution sources are the major contributor of pollution to impacted streams, marine waters, wetlands and estuaries" (The Resources

Agency of California, 1995). The central assumption of non point source pollution control efforts in agricultural watersheds is that traditional erosion control programs are sufficient to ensure high quality water resources. Inadequacies of that assumption were outlined, especially as they relate to the goal of attaining ecological integrity. The declining biotic integrity of our water resources over the past two decades is not exclusively due to water quality (physical/chemical) degradation. Improvement in many aspects of the quality of water resources must be approached with a much broader perspective than improvement of physical/chemical conditions (Dudley and Karr, 2005).

Groundwater Pollution

Interactions between groundwater and surface water are complex; groundwater aquifers are susceptible to contamination from sources that may not directly affect surface water bodies.

2.2.2 Water Pollution and its Impacts

According to the Palestinian Environmental Law number 7 / 1999, water pollution is defined as "any change in the characteristics or components of water, which may cause harm to the environment". Pollutant Substance and Agents: Any substance in the forms of gas, liquid, solid, aerosol, vapor, odor, noise, radiation, heat, flashlight, or vibrations which may result in the pollution or deterioration of the environment.

United Nations report at 1971, defined ocean pollution as: "The introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water and reduction amenities"

(www.edugreen.teri.res.in/EXPLORE/water/pollu.htm Water pollution: An introduction 2009).

There are many effects of water pollution, including poisonous drinking water, poisonous food animals, unbalanced river and lake ecosystems that can no longer support full life biological diversity, and acid rain. Waste water from manufacturing or chemical processes in industries contributes to water pollution. Domestic sewage plays a role in water pollution as well. Domestic sewage is waste water discarded from households, which contains a wide variety of dissolved impurities (http://www.earth911.org\master.asp. accessed on 21 May 2010).

The pollution of water resources has serious and wide range effects on the environment, human health, animals and plants. So the drinking of contaminated water causes sickness and disease; and the presence of toxic substances in the food and water can lead to reproductive problems and neurological disorders. Environmental Protection Agency (EPA) studies and monitors the effects of water pollution and uses this information to set healthy emissions standards and environmental regulations. The effects of water pollution are not only on humans but also on animals, plants, and on being unsuitable for drinking, recreation and industry. Also it negatively affects the quality of lakes and rivers (www.edugreen.teri.res.in/EXPLORE/water/pollu.htm).

About 80% of the wastewater produced in the GS is discharged raw into the sea. Sewage water treatment plants in GS depend on the secondary treatment; sometimes the process is limited to the primary treatment. Due to the continuous population increase and so the quantities of produced waste water and the failure of treatment plants, huge quantities of raw or partially treated waste water is discharged into the marine environment. This act of discharge doubles the negative impacts of waste water on the environment and public

health in the GS. Therefore, waste water is considered the main source of polluting GS sea shores because of the many points of sewage water discharge along the costal line. Discharging 80% of the produced waste water, untreated, in the sea is a very alarming hazard imposed by such reality on the marine environment and marine life (Abed Rabu, 1994).

A study conducted in Gaza revealed that Nitrate represents one of the major pollutants of groundwater in the GS. Several cases of blue babies disease were reported in the last few years. The study investigated the seasonal variations in nitrate concentration to better understand the mechanisms and parameters controlling this perilous pollutant. Nitrate was analyzed in 100 wells (47 agricultural and 53 domestic) in GS. The results showed that 90% of the tested wells have nitrate far beyond the allowed values set by the WHO. The average concentration of nitrate in domestic wells was 128 mg/L in June-July and 118 mg/L in Jan-Feb, and for the agricultural wells, the average was 100 mg/L in June-July and 96 mg/L for Jan-Feb. Environmental factors that control nitrate in groundwater were a partially-confined aquifer, lack of a sewage system, population density, the presence of fertilizers and the annual rain (Abu Maila, et al., 2004).

The report published by Al Mezan Centre for Human Rights regarding environment pollution and sanitation problems in Khanyounis presented the serious water, health and environmental problems faced by the quarter million people living in Khanyounis town due to the exacerbating sanitation situation. The report calls for urgent actions to deal with these problems, which affect a wide array of human rights in Khanyounis, and threaten water and health in the entire southern GS. The report presents a background on the sanitation problems in Khanyounis. It examines the role played by the Israeli occupation in the problem, which is one of the outcomes of neglecting of the basic needs of the GS towns

during the 38 years of direct Israeli occupation of the Strip between 1967 and 1994. Israel's administration had disregarded the needs of Khanyounis town for drainage and waste water systems. As a result, people were left with one choice - to dig absorption holes in the ground; a problem that was shared by other towns in the GS. This has contributed to the deterioration of the underground aquifer, which has reached a critical stage during 2009. In a more recent development, the report states that two sewage pools were dug in Al Mawasi area - an agricultural area along Khanyounis beach - where the south Gaza aquifer is located. These pools were initially created to collect rain water in an effort to protect the residents of West Khanyounis from the frequent winter floods and re-inject the rain water directly into the aquifer. However, lack of sanitation services pushed many people to connect their sewage to them. They have become a serious threat to the underground water and deprived the residents of the area from potable water (Al Mezan Centre for Human Rights, 2009).

Another study aimed to assess total and fecal contamination in water wells and distribution networks showed that the total and fecal coliform contamination exceeded the WHO limits for water wells and networks; the contamination percentage was higher in networks than in wells. Diarrheal diseases were strongly correlated with fecal coliform contamination in water network (r=0.98). This result was consistent with the findings that diarrhea was the most common self-reported disease among the interviewees. Such diseases were more prevalent among subjects who drank municipal water than subjects who drank desalinated or home-filtered water (odds ratio = 2.03). Intermittent water supply, insufficient chlorination and sewage flooding seem to be associated with self-report diseases (Abu Amer and Yassin, 2006).

2.2.3 Water Desalination

2.2.3.1 Salinity Historical Review

Salinity is an ecological factor of considerable importance that influencing the type of organisms that live in a body of water. Also, salinity influences the kinds of plants that will grow either in a water body or on land fed by water or by a groundwater. A plant adapted to saline conditions is called a halophyte. Organisms - mostly bacteria - that can live in very salty conditions are classified as extremophiles, halophiles specifically. An organism that can withstand a wide range of salinities is euryhaline. Salt is expensive to remove from water, and salt content is an important factor in water use such as potability. The technical term for saltiness in the ocean is halinity, from the fact that halides – chloride specifically – are the most abundant anions in the mix of dissolved elements. In oceanography, it has been traditional to express salinity not as percent, but as parts per thousand (ppt or 0.000), which is approximately grams of salt per liter of solution. Other disciplines use chemical analyses of solution, and thus salinity is frequently reported in mg/L or ppm (parts per million). Prior to 1978, salinity or halinity was expressed as 0.000 usually based on the electrical conductivity ratio of the sample to "Copenhagen water", artificial sea water manufactured to serve as a world "standard". In 1978, oceanographers redefined salinity in the Practical Salinity Scale (PSS) as the conductivity ratio of a sea water sample to a standard KCL solution. Ratios have no units, so it is not the case that a salinity of 35 exactly equals 35 grams of salt per liter of solution (Wikipedia, 2006).

The world's largest desalination plant is the Jebel Ali Desalination Plant in the United Arab Emirates. It is a dual-purpose facility that uses multi-stage flash distillation and is capable of producing 300 million cubic meters of water per year. By comparison the largest desalination plant in the United States is located in Tampa Bay, Florida, which began desalinating 25 million gallons (US Gal.) approximately 95000m³ of water per day in

December 2007. The Tampa Bay plant runs at around 12% the output of the Jebel Ali Desalination Plants. World-wide, 13,080 desalination plants produce more than 12 billion gallons of water a day, according to the International Desalination Association (http://www.pump-zone.com/resources/industry-news).

2.2.3.2 Salinity Definitions and Concept of Desalination

Salinity is the increased accumulation of excess salts in land and water at sufficient levels to impact human and natural assets (plants, animals, aquatic ecosystems, water supplies, agriculture, or infrastructure). Desalination refers to any of several processes that remove excess salt and other minerals from water. More generally, desalination may also refer to the removal of salts and minerals, as in soil desalination. Most of the modern interest in desalination is focused on developing cost-effective ways of providing fresh water for human use in regions where the availability of fresh water is, or is becoming, limited. Primary salinity is where increases in salinity have occurred solely through natural processes and secondary or induced salinity is where increases have occurred due to land use changes made by human activity. Because salinity can be produced by a variety of distinctly different land management and ground water flow system no one approach to managing salinity will work in all cases (Wikipedia, 2006).

Salinity is the saltiness or dissolved salt content of a body of water. Sea water contains 35g dissolved salt / kg = 3.5% = 35,000 ppm. Salinity in drinking water: 100 ppm, restriction on drinking water; 500 ppm, limit drinking water; 1000 ppm, limit agriculture irrigation; 2000 ppm, brackish water; 5000 – 30,000 ppm , sea water and 30,000 – 50,000 ppm is brine. Saline water is a general term for water that contains a significant concentration of

dissolved salts such as NaCl. The concentration is usually expressed in parts per million (ppm) of salt (Wikipedia, 2006). The salinity concentration level used by United States Geological Survey classifies saline water in three categories. Slightly saline water contains around 1,000 to 3,000 ppm, moderate saline water contains roughly 3,000 to 10,000 ppm and highly saline water has around 10,000 to 35,000 ppm of salt. Seawater has a salinity of roughly 35,000 ppm, equivalent to 35 g/L. Because of scarcity of fresh water in some areas of the world, saline water is used by desalinating it. For example, in Colorado, USA, water having up to 2,500 ppm of salt is used for irrigating crops. Saline water, known as saline, is also used in medicine as a sterile solution. Normally, moderately or highly salinated water is of little use to humans. Humans cannot drink salinated water directly, nor is it suitable for irrigating crops (Weligamage, et al., 2009).

Table (2.1): Classification of Water Based on Dissolved Salts in Parts per Thousand

Fresh water	Brackish water	Sea water	Brine
< 0.5	0.5-30	30-50	>50

A study conducted in Gaza showed that desalination became a strategic option in the scarce-water countries in general and in Palestine in particular. Its cost competes with the costs of other non-conventional water resources such as wastewater reuse and groundwater recharge. Water resources in GS suffer from deficit in the water balance of about 30%. From an environmental point of view, desalination has less negative impact compared to other solutions. It can participate in a significant role in the sustainability of the water resources. Various types of desalination plants in use are discussed. Technical and economical aspects of the various plants are considered. Special attention is given to the reverse osmosis (RO) plants. Although the cost of desalination is still relatively expensive for our case in the GS, reverse osmosis desalination is strongly recommended and

considered as a strategic alternative in order to overcome the water deficit and meet the future needs of desalination for the Strip. In addition and as part of the strategy, the power consumption of RO systems in GS shall be optimized with the global power consumption and capacity of the power plant under construction (El Sheikh, et al., 2003).

2.2.3.3 Desalination Stations in Khanyounis

There are two desalination stations in Khanyounis city; the first one is named "Alsaada" located near Khanyounis club on an area of 1-donum, the second one is the eastern well near Sheikh Nasser block on an area of 1-1.5 donums. These two wells serve most of Khanyounis residents. The city suffers from the high chloride ion and the high concentration of nitrate. The ratio of chloride in Alsaada well reached 817 mg/L while the allowable maximum degree for chlorine is 250 mg/L; this number proves that the well is contaminated chemically and not fit for drinking. In addition, the concentration of nitrate (NO3) in this well is 320 mg/L, while the allowable degree as maximum is 45 mg/L; this number shows that it is seven times more than the normal limit.

As a notice, most of the wells in Khanyounis suffer from these problems, so desalination station had to be established in Khanyounis. The municipality set up two central desalination stations for the entire city, these are "Alsaada well and eastern well", in addition to establishing small stations as "Al Shortah mosque desalination station, - Alayah station – Al Amal well" (Khanyounis municipality, 2010). There are more desalination stations which are non-municipal as shown in the table below:

Table (2.2): Desalination Stations in Khanyounis

Station	Site
Moayad Alnajar station	The Eastern Gizan area
Palestine station	License area
Alshalal station	East from the license area
Alkhateeb station	The camp
Ammar station	Khanyounis center
Almasry station	Sheikh Nasser area

Table (2.3): Water Chemistry Report (Alsaada well and desalination)

Element	Result		MAX result
	Al Saada desalination	Al Saada Well	
PH	7.71	7.68	6.5-8.5
E.C	381	3900	1500
T.D.S	236	2418	1000
Nitrates	49	320	70
Chlorides	70	817	600
Alkalinity	57	303	400
Fluorides	0.17	0.90	1.5

Table (2.4): Water Chemistry Report (Eastern well and desalination)

Element	Result		MAX result
	Eastern Well	Eastern Station	
PH	7.84	7.6	6.5-8.5
E.C	4420	330	1500
T.D.S	2740	205	1000
Nitrates	188	41	70
Chlorides	928	66	600
Alkalinity	345	50	400
Fluorides	2.07	0.33	1.5

Table (2.5): Water Contamination Examination

No	Source of sample	Total coliform	Fecal coliform
1	El-Ali Desalination	Negative	Negative
2	Moaied El-Najar-Desalination	Negative	Negative
3	Palestine- Desalination	Negative	Negative
4	Elshlal- Desalination	Negative	Negative
5	Elssada- Desalination	Negative	Negative
6	Ammar- Desalination	Negative	Negative

2.2.4 Water Quality and Management in Gaza Strip

2.2.4.1 WHO Standards for Drinking Water

Freshwater is a word that refers to bodies of water such as ponds, lakes, rivers and streams containing low concentrations of dissolved salts and other total dissolved solids. In other words, the term excludes seawater and brackish water. Freshwater can also be the output of desalinated seawater. Freshwater is an important renewable resource, necessary for the survival of most terrestrial organisms, and is required by human for drinking and agriculture, among many uses. WHO apply safe drinking water standard parameter these are the most important parameters determining safe drinking water, chloride is 250 mg/l , fluoride 1.5 mg/l, sodium 160 mg/l, nitrate 50mg/l, and TDS 600mg/l. (WHO,1999).

2.2.4.2 Water Quality

Water quality refers to the physical, chemical and biological characteristics of water. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to drinking water, safety of human contact and for the health of ecosystems. Any physical, chemical or biological property that influences the use of water is a water quality variable, and the term water quality refers to the suitability of water for a particular purpose. Water quality standards have been developed to serve as guidelines for selecting water supplies for various activities or for protecting water bodies from pollution (Claude, 2000).

2.2.4.3 Standards

In the setting of standards, agencies make political and technical/scientific decisions about how the water will be used. In the case of natural water bodies, they also make some reasonable estimate of pristine conditions. Different uses raise different concerns and

therefore different standards are considered. Natural water bodies will vary in response to environmental conditions. Environmental scientists work to understand how these systems function which in turn helps to identify the sources and fates of contaminants. Environmental lawyers and policy makers work to define legislation that ensures that water is maintained at an appropriate quality for its identified use. The vast majority of surface water on the planet is neither potable nor toxic. This remains true even if sea water in the oceans (which is too salty to drink) is not counted. Another general perception of water quality is that of a simple property that tells whether water is polluted or not. In fact, water quality is a very complex subject, in part because water is a complex medium intrinsically tied to the ecology of the Earth. Industrial pollution is a major cause of water pollution, as well as runoff from agricultural areas, urban storm water runoff and discharge of treated and untreated sewage, especially in developing countries (USEPA, 2006).

2.2.4.4 Human Consumption

Contaminants that may be in untreated water include microorganisms such as viruses and bacteria; inorganic contaminants such as salts and metals; pesticides and herbicides; organic chemical contaminants from industrial processes and petroleum use; and radioactive contaminants. Water quality depends on the local geology and ecosystem, as well as human uses such as sewage dispersion, industrial pollution, and use of water bodies as a heat sink, and overuse which may lower the level of the water.

In the United States, the U.S. EPA limits the amounts of certain contaminants in tap water provided by public water systems. The Safe Drinking Water Act authorizes EPA to issue two types of standards: *primary standards* regulate substances that potentially affect

human health, and *secondary standards* prescribe aesthetic qualities, those that affect taste, odor, or appearance. Some people use water purification technology to remove contaminants from the municipal water supply they get in their homes, or from local pumps or bodies of water. For people who get water from a local stream, lake, or aquifer (well), their drinking water is not filtered by the local government (USEPA, 2006).

2.2.4.5 Measurement

The complexity of water quality as a subject is reflected in the many types of measurements of water quality indicators. Some of the simple measurements that can be made on-site include: temperature, pH, dissolved oxygen, conductivity, oxygen reduction potential (ORP). More complex measurements that must be made in a lab setting require a water sample to be collected, preserved, and analyzed at another location. Making these complex measurements can be expensive. Because direct measurements of water quality can be expensive, ongoing monitoring programs are typically conducted by government agencies. However, there are local volunteer programs and resources available for some general assessment. Tools available to the general public are on-site test kits commonly used for home fish tanks and biological assessments. The diagram below shows assessment of the occurrence of chemicals that can harm water quality, such as nutrients and pesticides in water resources, requires recognition of complicated interconnections among surface water and ground water, atmospheric contributions, natural landscape features, human activities, and aquatic health. The vulnerability of surface water and ground water to degradation depends on a combination of natural landscape features, such as geology, topography, and soils; climate and atmospheric contributions; and human activities related

to different land uses and land-management practices (http://ga.water.usgs.gov/edu/waterquality.html. accessed 1, 4, 2010)

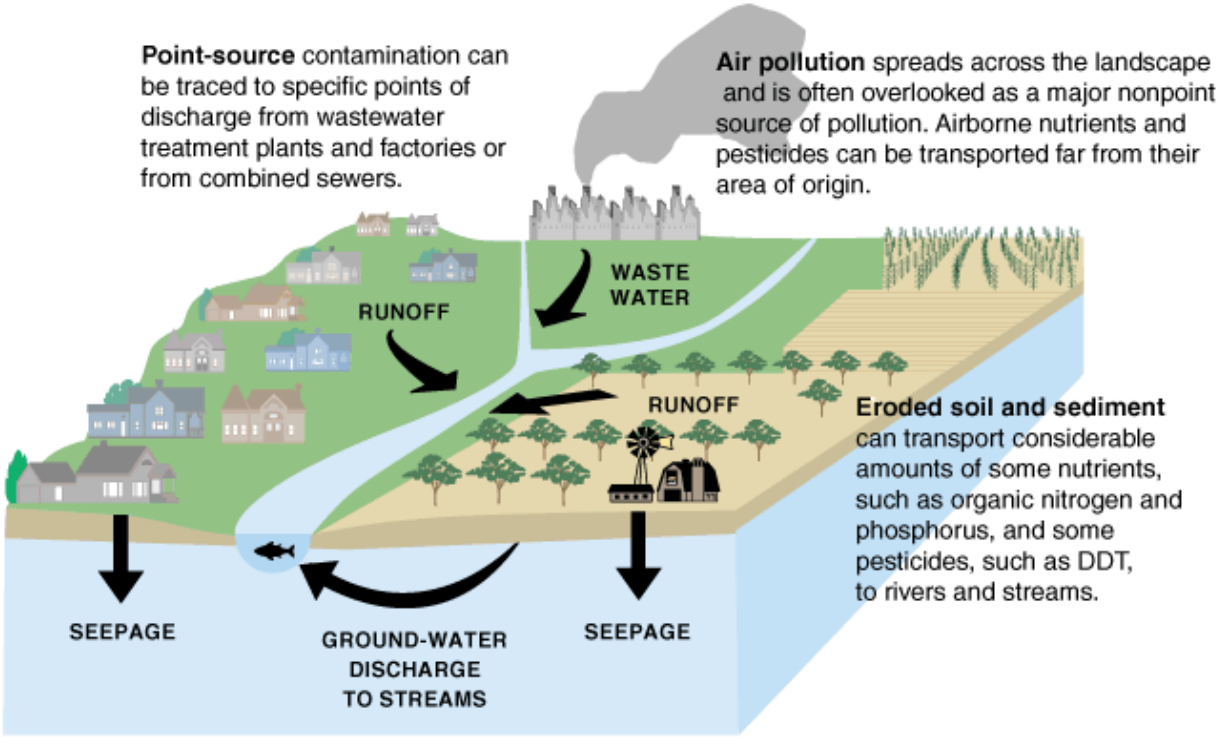

Diagram 2.2: Assessment of Occurrence of Chemicals which Harm Water Quality

Logan, (2003) said that the first awareness about agriculture source of water pollution was in 1960. In 1990 there was a commitment at the national level of the USA for agricultural nonpoint source (NPS) pollution control which is occasioned with growing awareness, and the point source which is controlled by waste water treatment. Also Logan discussed the fundamental processes affecting the transport of agricultural pollutants in surface and groundwater and suggested how knowledge of these processes can be used to evaluate existing agricultural NPS and best management practice and to develop supplemental practice.

Pollution of the ground water is a major problem in GS, and the aquifer is highly vulnerable to pollution. The domestic water is becoming more saline every year and its

average concentration reached more than 500mg\l, also most of the public drinking water supply wells have high salinity concentrations (Abu-Safieh, 1993). According to reports and studies by Palestinian Water Authority (PWA), 95% of Gaza residents receive a water service, which means that most of the population has access to an indoor tap. Most of the distribution systems in the municipalities operate a time table for supplying drinking water. The use of roof top tanks with a 1-2m $^{3\ \text{capacity}}$ is a common practice in all houses in Gaza (Abu-Safieh, 1993). Recent studies of the quality of drinking water wells in the GS for the year 1989-1990 have shown that almost 85% of the water in these wells is not suitable for drinking according to WHO water quality standers for human or agricultural use (Abu-Safieh, 1991). The main ground water quality problem in GS is elevated chloride concentration. Fifty percent of Gaza municipal wells sampled in 1998\1999 failed the WHO drinking water acceptable level for chlorides of 250 mg per liter (UNEP, 2003).

In a study conducted in Gaza regarding the present situation of waste water and the possible prospect for its reuse in the GS, found that the level of ground water, the main water resource in the GS, is being depleted and its quality is adversely affected. The agriculture sector is a major consumer of groundwater. Waste water reuse appears to be promising option to cover part of the water demand. The existing three (Beit Lahia, Gaza and Rafah) waste water treatment plants (WWTPs) are overloaded. The quality of the effluent from Gaza and even Beit-Lahia WWTPs would be acceptable whereas that of Rafah WWTPs is of poor quality. Acceptance to use treated waste water for irrigation is crucial aspect to ensure the success of any reuse project. Opinion of 79 farmers was sought for using treated waste water, through. The majority of farmers (86.1%) agreed to use the treated wastewater for irrigation .Most of the farmers (98.9%) appeared willing to pay for treated waste water. There is a plan to construct three WWTPs which will replace the existing ones by the year 2020. The new plants will serve all Gaza governorates efficiently

and will offer a better effluent quality for irrigation of major economic crops. The future of water balance in the area will depend on the portion of effluent reused in irrigation and recharging in the aquifer (Yassin et al, 2004).

2.2.5 Waste Water Reuse

Palestinians have recently begun to reuse waste water as an additional water source. The total quality of wastewater from domestic and industrial uses in GS and in WB is estimated to be roughly 40 MCM/yr. In the Gaza city area, sewage from non-functioning treatment plants is discharged onto neighboring land. In the future, treatment of wastewater should be considered as a major resource of water, particularly for agriculture and especially in Gaza. The lack of waste water treatment also poses potentially serious risks to the environment and human health. In Gaza, access to sewerage facilities at present varies from one area to another where more than 80% of the households are served by well-functioning sewerage system and about 60% of the population is connected to a sewerage net work. Approximately 70-80% of the domestic wastewater produced in Gaza is discharged into the environment without treatment (UNEP, 2003).

2.2.6 Drinking Water Guidelines and Standards

The Environmental Protection Agency (EPA) sets National Primary and Secondary Drinking Water Standards in collaboration with community water system organizations, scientists, state and local agencies, the public, and others. States and Native American Communities facilitate implementation of these standards by regulating public and private water systems. Drinking water standards are always evolving as new analytical methods are developed, scientific information becomes available, and new priorities are set in response to the potential health effects of contaminants (ADWR, 2007).

2.2.6.1 Primary Drinking Water Standards

The EPA considers many issues and factors when setting a standard. These include current scientific data, availability of technologies for the detection and removal of contaminants, the occurrence or extent of a chemical in the environment, the level of human exposure, potential health effects (risk assessment) and the economic cost of water treatment. Community water systems must comply with National Primary Drinking Water Standards (NPDWS) by providing water to their customers that does not exceed the MCL of any listed contaminant.. Primary contaminants regulated under the NPDWS include inorganic contaminants such as arsenic and lead, organic chemical contaminants such as insecticides, herbicides, and industrial solvents like trichloroethylene, water disinfectants such as chlorine and chloramines, disinfection by-products such as chloroform, radio-nuclides such as uranium and microorganisms such as Giardia and intestinal viruses (Abu Safieh, 1994).

2.2.6.2 Secondary Drinking Water Standards

EPA has established NSDWS that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these "Secondary Maximum Contaminant levels" or SMCLs. They are established only as guidelines to assist community water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health, and community water systems are not required to reduce these chemicals below the SMCL. However, water utilities control the levels of these chemicals in the water in order to prevent tap water odor and taste-related customer complaints. The Palestinian water law confirms and assures the optimal utilization of water resources and addresses the protection of public

water from pollution accordingly. The Environment Quality Authority (EQA) has prepared regulations and standards in many different themes regarding water pollution control, and it includes: Drinking water quality standards, waste water reuse standards and its executive list and discharge. (Abu Safieh, 2006).

Table (2.6): American Secondary Drinking Water Standards

Contaminant	Secondary Standard	Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L	Manganese	0.05 mg/L
Chloride	250 mg/L	Odor	3 threshold odor number
Color	15 (color units)	pH	6.5-8.5
Copper	1.0 mg/L	Silver	0.10 mg/L
Corrosivity	Non-corrosive	Sulfate	250 mg/L
Fluoride	2.0 mg/L	Tot. dissolved solids	500 mg/L
Foaming Agents	0.5 mg/L	Zinc	5 mg/L
Iron	0.3 mg/L		

2.2.7 Environmental Education

During the 1960s and 1970s, environmental issues began receiving more nation attention, and environmental education seemed to have a very promising future as laws and programs began to be created in support of the subject area (Hengar, 2005). In 1970, the first international workshop on environmental education in Carson City, Nevada, developed the first definition of environmental education and setout to address concerns about its implantation and its implication in regards to environmental conservation (Flynn, et al., 2002). As early as the 1972 United Nations conference of the environmental community recognized that economic security and development is directly tied to the health of the environment (Kibert, 2000). As a result of directives from the Stockholm Conference, from

which the declaration of the United Nations Conference of the Human Environment was created, the Intergovernmental Conference on Environmental Education was held in Tbilisi, Georgia in 1977 where the Tbilisi Declaration was adopted. The critical objectives of the Tbilisi Declaration included heightening people's environmental awareness, sensitivity, attitude and concern for the environment, skills and motivation to act for environmental improvement and protection, and participation in solving environmental problems (Knapp, 2000). As environmental education developed over the years, a need for specific guideline explaining what individuals should know and be capable of doing after their education was growing. UNESCO and UNEP organized an International Congress in Moscow, in order to determine an international strategy for action in environmental education and training for the 1990s (UNESCO and UNEP, 1995). Five years later, the United Nations organized "Earth Summit" in Rio de Janeiro, 1992 on Environment and Development to assess 20 years of work in the field of environment following the 1972 Stockholm conference. In September 2002 in order to assess progress made in this direction on a worldwide basis, the UN organized the World Summit on Sustainable Development I Johannes Burge, South Africa (Hengar, 2005).

2.2.8 Environmental Awareness and Education

Environmental problems due to different sources of pollutants are worldwide especially in industrial countries. Several studies have been conducted to examine or raise environmental awareness. A study conducted in Vietnam aimed to evaluate primary school teachers' awareness on environmental problems, protection and education, and studying their role as teachers and their capacities to meet the requirements of environmental education. Teaching environmental education requires from teachers not only a deep and thorough awareness of environmental problems, protection and education but also a

creative thinking power and the capacity to apply theoretical knowledge in general to a concrete local environment. The results of the study showed that Vietnamese primary schoolteachers lack both of the required qualities. In this regard, the following suggestions were proposed: (1) to place as high priority the creative thinking power and research abilities in the teachers' training objectives; (2) to organize courses on environmental problems, protection and education for in-service teachers; (3) to establish programmers and prepare learning materials for the teachers (Nguyen, 2001). Another study aimed to evaluate environmental awareness of students from different levels showed that 91% of the students claim to know the concept of environment, 87% differentiate between environmental protection and public sanitation, 85% consider environment to be a resource, and 94% think that natural environment has a price, 93% of the study respondents have heard about environmental protection laws, 80-95% had heard about that it is prohibited to import / export rubbish that paying pollution fees can not substitute the necessity for environmental recovery, and which are the responsibilities of the environmental department. The male respondents were more aware of knowledge and environmental law than female respondent who in turn are more willing to participate in environmental activities (46% of males vs. 27% of female) know the environment days date, males ranked the environment as third most important problem, females as the second most important one, only 49% of male and 63% of female want to participate in environmental action (Palmer, 1998).

Several studies have found that knowledge and awareness level can vary considerably between different topics and student's environmental awareness was affected by several factors, such as gender (Sheila, 2004). On the gender issue, diverging results have been found. Many studies revealed that males reflected higher level of awareness about

environmental issues than females. Gayford, et al. (1996) found in their study of undergraduates that males scored higher in environmental knowledge than females.

Hausbeck, et al., (1992), reported that males had slightly more environmental knowledge than females. In their study concerned with specific facts and concepts about acid rain, the greenhouse effect and further source of energy. Gambro and Switzky (1998) reported that male students had significant higher levels of environmental knowledge than female students and the relationship remained significant when the number of science classes taken by students was controlled. An information sheet has been designed by to investigate some of the myths and assumptions associated with gender and environmental education, as well as to suggest methods teachers can use to address these issues.

There are many assumptions that must be addressed when considering the involvement of women in science related subjects. A major assumption is that men and women have identical learning experiences at school. In reality, the experience is different for each gender, and similarly, for each individual (Gambro & Switzky, 1994).

Women are also viewed as having less interest in science and mathematics than men have. Another assumed gender related difference that may have an effect on involvement in environmental education is that women are more intuitive and rely more on feelings. Women are considered to be passive rather than speaking out or defending their opinion and are thought of as being dependent on others, less comfortable with themselves, and less likely to seek a life of their own (Owens and Cooney 1998). Another study suggested that gender is an influential factor in gaining environmental knowledge. The number of science classes taken by students factored into the differences in knowledge between genders, but did not account for the entire difference. In this study, out of a group of high school students questioned about energy and pollution issues, 29.2% of females had satisfactory knowledge as compared with almost 44% of male students (Gambro and

Switzky, 1994). There also some assumed gender related moral differences that may affect attitudes and activities surrounding environmental education. As mentioned, women may make decisions based on feeling, while men base their decisions on fact and science. Within the classroom, female students may receive less attention than their male counterparts, and even that attention may be a lower quality. Studies have also shown that stereotypical gender role orientation affects care voice. The aforementioned stereotyping of each gender can, over time, be detrimental to female self-esteem and confidence when considering involvement in science. These stereotypes and assumptions could lead to a decrease in female achievement and an increase of negative attitudes, reducing desire to pursue science and environmental careers.

2.2.9 KAP Regarding Environment

A study was conducted to evaluate the environmental awareness among school-age children in Gaza city. The study aimed to determine the level of environmental awareness and attitude among students of class nine in the governmental high basic school in Gaza city, and their relationships with gender, residential area and grade of students' scores achievement at school. Also, to investigate the relation between environmental awareness and attitude, the results indicated that the study students have a relatively moderate level of environmental awareness, with a mean score of 16.85 (total 24 score) and percentage of their environmental awareness level was 70.2%. While their positive attitude toward the environmental was low with a mean of 19.30 scores (total 30 score) with a percentage of about 64.33%. There were significant differences in the level of environmental awareness and attitude based on gender. One of the most interesting results was that, males have a significantly higher environmental awareness than females, while females have shown more positive attitude toward environment than males. In addition, significant differences

were found in the students' environmental awareness and attitude based on student's place of residence favoring resident area, that the level of environmental awareness and attitude among students of the study area was higher than those of the other three areas in Gaza city (popular area, recent area and agricultural area). Also, significant differences were found in the students' environmental awareness and attitude according to grade of students study achievement at school favoring students whose grades were higher than 90%, which indicates that there was a direct proportional relation between the level of environmental awareness and attitude with students' grade. The results showed that there was a positive significant relationship between environmental awareness and attitude among the study population (Sarsour, 2007).

In Hong Kong, a study was implemented to explore the teacher's perceptions of teaching environmental issues within the science curriculum: The study was an exploratory study of Hong Kong secondary school integrated science teachers perceptions of environmental education. Both questionnaire survey and interviews were used. Teachers were classified according to their scores of attitudes, perceived barriers, and current emphasis on teaching environmental education. The study found that Integrated Science teachers' attitudes toward environmental education, skills of teaching environmental education, beliefs in the relevance of integrated science to environmental education, and intention of teaching environmental education in integrated science classes were associated with their actual ways of teaching of environmental education. Teachers tended to teach more environmental education if they held more favorable attitudes toward environmental education, had more skills of teaching environmental education, believed more in the relevance of Integrated Science to environmental education, and would actually want to teach more environmental education in Integrated Science classes if there were fewer constraints. Moreover, variations in the teaching of environmental education were reflected

by teacher's emphasis on teaching environmental education, and their use of a variety of teaching methods and their regular practices of extracurricular activities on environmental education (Chi-Chung and Lee, 2003).

2.2.10 Palestinian environmental law

Before the establishment of PNA, there were no rules / regulations to control water pollution and protect water resources. The first Palestinian environmental law was declared on 1999 (Palestinian Environmental Law No. 7 / 1999), water pollution is defined as "any change in the characteristics or components of water, which may cause harm to the environment". Pollutant Substance and Agents: Any substance in the forms of gas, liquid, solid, aerosol, vapor, odor, noise, radiation, heat, flashlight, or vibrations which may result in the pollution or deterioration of the environment.

The objectives of this law are:

1. Protection of the environment against all forms and types of pollution;
2. Protection of Public health and welfare;
3. Insertion of the bases of environmental protection in social and economic development plans; and encouragement of sustainable development of vital resources in a manner that preserves the rights of future generations;
4. Protection of bio-diversity and environmentally sensitive areas, as well as improvement of environmentally harmed areas;
5. Encouragement of collection and publication of environment-related information to raise public awareness of environmental problems.

2.2.11 Summary

Water is fundamental for life and without water no life will exist. The Palestinians are facing a major problem regarding safe water supply that is suitable for drinking. The ground water at most of Gaza governorates is considered of high salinity due to excessive salts dissolved in the water, besides that, the problem of contamination due to mix of water with sewage as a result of improper sewage network and disposal of wastes. Examination of most of the wells revealed disastrous results for humans, animals and agriculture.

In order to overcome this problem, the researcher believes that environmental awareness is the corner stone in this issue and extra efforts should be enacted to face this challenge. Environmental education at school should be obligatory to maintain high levels of knowledge and attitudes toward environment and encourage safe environmental practices, because safe environmental circumstances is a major source of welfare and wellness for the population. This can be attained through formal educational classes and outdoor trips to environmental resources, including water resources, water planets and disposal areas.

Coordination between Ministry of Education, Palestinian Water Authority and municipality should be emphasized to develop proper programs and activities regarding safe environment.

Chapter Three

Methodology

This chapter addresses issues related to methodologies used to answer the research questions. The chapter commences with study design, study population, study setting, and period of the study, sample size and sampling. It presents construction of the questionnaire, piloting, ethical consideration and procedures, (data collection and data analysis). Furthermore it illustrates the validity and reliability of the study instrument and eligibility criteria of the study

3.1 Study Design

The researcher used descriptive, analytical, cross-sectional design to describe the present status of the level of KAP among primary school teachers in Khanyounis governorate. Cross-sectional studies are generally carried out on a population at a point of time or over a short period (Coggon, et al., 1993). Cross-sectional studies are usually quick and cheap compared to other study designs (Polit, 2004).

3.2 Study Population

The study population consisted of all primary school teachers in Khanyounis governorate (2066) teachers from 85 schools, 59 governmental Schools (1000 teachers) and 26 UNRWA schools (1066 teachers).

3.3 Sample and sampling

The Directorate of Education at UNRWA and Ministry of Education gave the researcher permission for 15 schools to be accessed as a sample in this study. The researcher distributed 350 questionnaires, 221questionnaires in UNRWA primary schools and 129 in

governmental schools, 330 questionnaires were collected back with a response rate of 94% (208 questionnaire from UNRWA primary schools and 122 from governmental primary schools).

The sample of this study was accidental nonpropability sample, because the researcher did not have the choice of randomly selecting the schools or the teachers.

3.4 Eligibility Criteria

3.4.1 Inclusion Criteria

- Any teacher male or female employed at UNRWA or governmental primary school at the assigned primary schools in Khanyounis governorate.
- Have full time contract for the academic year 2010 – 2011.

3.4.2 Exclusion Criteria

- Teachers who are working in prep or secondary schools.
- Teachers working out of Khanyounis governorate.

3.5 Setting of the Study

This study was conducted in selected primary schools in Khanyounis (7 UNRWA and 8 governmental schools).

3.6 Period of the Study

The study was conducted the academic year 2010 – 2011. Data were collected in September and October 2010.

3.7 Instrument of the Study

Self-administrated questionnaire was designed in Arabic and English to accomplish the objectives of this study of investigating the KAP regarding water pollution among primary school teachers.

3.8 Questionnaire Design

The questionnaire was constructed as close ended questions and was divided into four parts.

- The first part included personal information;
- The second part included knowledge about water pollution, consisted of 28 items;
- The third part included attitudes about water pollution, consisted of 20 items and
- The fourth part included practice about water pollution, consisted of 19 items.

3.9 Pilot Study

For the purpose of examining validity and reliability of study instrument, a pilot study has been conducted before data collection. Thirty five teachers were selected randomly for piloting (they were excluded from the actual study).

3.10 Validity and Reliability

3.10.1 Validity of the questionnaire

Validity of an instrument is essential step before the actual data collection. Validity is defined as "the extent to which an instrument measures what it is supposed to measure (Polit, 2004).

3.10.1.1 Face Validity

The researcher submitted the questionnaire to experts in the field for their comments regarding the contents of the questionnaire, then their comments were reviewed and necessary modifications were implemented.

3.10.1.2 Internal Consistency

The researcher performed correlation coefficient (using SPSS program) between each subscale and the total score of the scale as shown in table 3.1.

Table (3.1): Correlation between Subscales and Total Score of the Scale (KAP)

Subscale		***P* value**
Knowledge	R (Pearson Correlation) S (Sig. (2-tailed)	0.604 0.000
Attitude	R (Pearson Correlation) S (Sig. (2-tailed)	0.667 0.000
Practice	R (Pearson Correlation) S (Sig. (2-tailed)	0.672 0.000

3.10.2 Reliability

Reliability is concerned with how consistently the measurement technique measures the concept of interest, a measure is considered reliable if it gives the same results each time the situation is measured (Burns & Grove, 1997 and Polit, 2004). To ensure reliability, the researcher used Cronbache alpha coefficient.

Table (3.2): Cronbache Alpha Coefficient

Subscale	Alpha Coefficient
Knowledge	0.616
Attitude	0.751
Practice	0.682

3.11 Ethical Consideration

- Required permissions and approvals were obtained before conducting the study including; Helsinki committee, education department at UNRWA, Ministry of Education – Khanyounis directorate.
- Every participant received a complete explanation about the purpose of the study, instructions and the duration to complete the questionnaire.
- Confidentiality was maintained at all times during the study.

3.12 Data Collection

The data collection was accomplished through using the questionnaire which was distributed to the selected study participants. The study subjects filled-in the questionnaire with the help of the researcher.

3.13 Data Entry and Analysis

The data were entered and analyzed using the Statistical Package for Social Science (SPSS) program version 13 .The questionnaires were coded and entered by researcher with the assistance of a statistician.

Data analysis was carried out as follows:

- Reviewing the filled-in questionnaires.
- Coding of questionnaires.
- Choosing data entry model.
- Data cleaning.
- Statistical procedures used included frequency tables, percentage, t test, ANOVA test and Post Hoc Scheffe test.

3.14 Limitation of the Study

The study was limited to the following;

- The topic of the study which was limited to examine KAP regarding water pollution among primary school teachers in Khanyounis.
- Place: the study took place in Khanyounis governorate only.
- Time: the study was limited for the teachers during the academic year 2010 – 2011.
- The researcher faced some obstacles during preparation of this study including frequent cutoff of electricity and financial support.

Chapter Four

Results and Discussion

In this chapter the researcher presented the main study results which include: the socio-demographic characteristics of the study participants and the level of KAP regarding water pollution. The researcher calculated frequencies and percentage of the different characteristics and variables. Comparisons between variables were performed using t-test and one-way ANOVA test.

4.1 Sample Characteristics

The socio-demographic characteristics of the study sample are displayed in table 4.1.

Table (4.1): Characteristics of Study Sample

Character	Frequency	Percentage
Gender		
Male	114	34.5
Female	216	65.5
Total	**330**	**100.0**
Age		
20-30 years	133	40.3
31-40 years	92	27.9
41-50years	67	20.3
51 years and above	38	11.5
Marital status		
Married	297	90.0
Single	28	8.5
Divorce / widow/er	5	1.5
School type		
UNRWA	208	63.0
Government	122	37.0
Qualification		
Diploma	69	20.9
Bachelor	255	77.3
Post graduate	6	1.8
Years of experiences		
less than 5 years	138	41.8
5-10 years	59	17.9
more than 10 years	133	40.3
Training courses in the field of health or environment?		
Yes	72	21.8
No	258	78.2

The study sample consisted of 330 primary school teachers from Khanyounis governorate. Of them, 34.5% were males and 65.0% were female; 63.0% from UNRWA schools and 37.0% from Government schools. Their age ranged between 20 to over 51 years old; of them 40.3% were 20 – 30 years old, 27.9% were 31 – 40 years old, 20.3% were 41 – 50 years old and 11.5% were 51 years old and above. Among them, 20.9% have diploma certificate, 77.3% have bachelor degree and 1.8% have post graduate studies. Concerning experience, the table shows that 41.8% of the participants have less than 5 years of experience, 17.9% have 5 – 10 years and 40.3% have more than 10 years of experience. Among the study participants, 21.8% teachers had training courses in the field of health or environment and 78.2% did not.

4.2 Study Results

4.2.1 Knowledge

To examine the level of knowledge regarding water pollution, the researcher calculated the frequency and percentage of study participants' response on knowledge items. The results are illustrated in the following tables.

4.2.1.1 Source of Knowledge

Table (4.2): Source of knowledge

Item	Frequency	Percent
Do you know about water pollution?		
Yes	315	95.5
No	15	4.5
Did you get that knowledge during school or university study?		
Yes	290	87.9
No	40	12.1

The results show that 95.5% of the study participants know about water pollution and 87.9% got that knowledge during their study at school or university.

4.2.1.2 Water Pollution and Health

Table (4.3): Water Pollution and Health

Item	Frequency	Percent
Can polluted water cause disease to human?		
Yes	328	99.4
No	2	0.6
Does water pollution cause kidney disease and Hepatitis?		
Yes	316	95.8
No	14	4.2
In your opinion, is wastewater one of the sources of water pollution?		
Yes	314	95.2
No	16	4.8
Do you think that there is a relationship between diarrhea and water pollution?		
Yes	276	83.6
No	25	7.6
Do not know	29	8.8
Do you think that there is a relationship between water pollution and the increase in frequency of hospitalization?		
Yes	271	82.1
No	28	8.5
Do not know	31	9.4
Do you think that there is a relationship between water pollution and mortality rate?		
Yes	186	56.4
No	64	19.4
Do not know	80	24.2

The results show that 99.4% of the study participants know that polluted water can cause diseases to humans and 95.8% believe that polluted water can cause kidney disease and hepatitis; 95.2% believe that wastewater is one of the sources of water pollution. Also,

83.6% of study participants think that there is a relationship between diarrhea and water pollution; 82.1% think that there is a relationship between water pollution and increase in the frequency of hospitalization and 56.4% think that there is a relationship between water pollution and mortality rate.

4.2.1.3 Environment and Water Pollution

Table (4.4): Environment and Water Pollution

Item	Frequency	Percent
Do you have some knowledge about environmental sciences?		
Yes	239	72.4
No	58	17.6
Do not know	33	10.0
Is the environmental education considered part of the curriculum in primary schools?		
Yes	217	65.8
No	65	19.7
Do not know	48	14.5
Do you know if there are legislative rules to protect the environment?		
Yes	201	60.9
No	78	23.6
Do not know	51	15.5

From table 4.4 the results show that 72.4% of the study participants have some knowledge about environmental sciences, 65.8% considered environmental education as part of school curriculum and 60.9% know that there are legislative rules to protect the environment.

4.2.1.4 Why Humans Pollute Water?

Table (4.5): Reasons That Make Humans Pollute Water

Item	Frequency	Percent
Lack of community awareness about the environment	143	43.3
Causes related to individuals' education	50	15.2
Absence of clear environmental policies regarding disposal of wastewater	137	41.5

Regarding the reasons that make people pollute the water, 43.3% of study participants related it to lack of community awareness, 15.2% related it to individual's education and 41.5% related it to absence of clear environmental policies regarding disposal of wastewater.

4.2.1.5 Sewage Network

Table (4.6): Sewage System and Water Pollution

Item	Frequency	Percent
Is there a sewage network in your residential area?		
Yes	244	73.9
No	86	26.1
In the absence of sewage network, are open sewers used as a method for the disposal of wastewater?		
Yes	109	33.0
No	221	67.0
In the absence of sewage network, are septic tanks used as a method for the disposal of wastewater?		
Yes	204	61.8
No	126	38.2

The results in table 4.6 above show that 73.9% of study participants reported that there was a sewage network in their residential area, 33.0% used open sewers for wastewater disposal in the absence of sewage network and 61.8% use septic tanks for the disposal of wastewater.

4.2.1.6 Water Consumption and Sources

Table (4.7): Water Consumption and Sources

Item	Frequency	Percent
Source of drinking water		
Municipality	123	37.3
UNRWA	14	4.2
Commercial water	193	58.5
In average, how much water do you drink every day?		
More than 3liters	196	59.4
Less than 3liters	134	40.6
Has the water for drinking been treated since 10 years?		
Yes	78	23.6
No	252	76.4
Do you currently treat the water in the house before consumption?		
Yes	159	48.2
No	171	51.8
Do use filters for water purification?		
Yes	129	39.1
No	201	60.9
Do you use drinking water for cocking?		
Yes	287	87.0
No	43	13.0

The results in the above table (4.7) show that 37.3% of respondents used municipality supply for drinking water, 4.2% used UNRWA water supply and 58.5% buy the drinking

water (filtered water), 59.4% of respondents drink more than 3liters of water/day and 40.6% drink less than 3liters. Also, 76.4% said that drinking water have not been treated before 10 years and 48.2% are currently treat drinking water before use, 39.1% use water filters at home and 87.0% use drinking water for cocking.

4.2.1.7 Tanks

Table (4.8): Water Tanks

Item	Frequency	Percent
Do you have water tanks in your house?		
Yes	330	100.0
No	0	0
Type of water tanks		
Black plastic tanks	314	95.2
White plastic tanks	10	3.0
Tin tanks	6	1.8
Are the water tanks closed well in your house?		
Yes	318	96.4
No	12	3.6
Presence of impurities, sediments or algae in water tanks at school / house		
Yes	181	54.8
No	149	45.2
In your opinion, what are the causes of polluting drinking water tanks?		
Sediments / turbidity / stagnant water for long time	53	16.1
The tank is not clean and is not closed well	16	4.8
All of the above	261	79.1
How many times do you clean the water tank at home per year?		
1 – 2 times	152	46.1
3 – 4 times	80	24.2
5 times and more	98	29.7

As shown in table 4.8, all study participants have water tanks at their houses; of them 95.2% have black plastic tanks, 3.0% white plastic tanks and 1.8% tin tanks; 96.4% of the tanks are closed well. When asked about causes of water pollution in the tanks, 16.1% relate that to sediments or stagnation of water for long time and 4.8% said that the tank is not clean or not closed well. Regarding cleaning the tanks, 46.1% cleaned the tanks 1 – 2 times / year, 24.2% cleaned it 3 – 4 times and 29.7% cleaned it 5 times and more.

Generally, the above results showed that the mean percentage for knowledge was 81.17. from the researcher's point of view, this result is not very high when taking in consideration that study participants are qualified persons with university degree and working in the teaching field. This result highlight the need for implementing an educational program aiming at raising the level of knowledge among school teachers in Gaza governorates.

4.2.2 Attitudes

Table (4.9): Attitudes toward Water Pollution

	Item	Disagree %	Neutral %	Agree %
1	Domestic water has a good quality	57.9	5.5	36.6
2	Domestic water is sufficient	55.7	2.1	42.2
3	There is a water pollution problem in Khanyounis Governorate	7.2	8.5	84.2
4	I believe that polluted water can cause harmful diseases to humans	0.9	1.5	97.6
5	Pollution of ground water can affect the community health	2.1	3.0	94.8
6	Mixing of groundwater with sewage can harm the humans' health	1.5	2.1	96.3
7	Acid rain does not affect the quality of groundwater	58.8	21.5	19.7
8	I believe that mixing of sewage with groundwater must be reduced	5.1	3.9	90.9
9	Water pollution can be reduced	3.0	4.5	92.4
10	Salinity of water in the house can be treated by filtration	9.7	5.5	84.8
11	The quality of water in the house can be improved in terms of clarity and transparency through using filtration methods	8.5	5.8	85.8
12	Continuous supply of filtered water for drinking all can be maintained all the day.	15.1	8.2	76.6
13	I believe it is important to penalize those who pollute water according to the laws	2.4	3.3	94.2
14	It is important to have the proper tools to handle water pollution	0.6	3.6	95.8
15	It is important to cooperate with the competent committees in the field of water pollution	0.3	2.1	97.5
16	It is important to enact laws and legislations to control water pollution	0.6	2.1	97.2
17	Health education has an important role in reducing the kidney failure disease	1.8	4.5	93.6
18	Mass media discusses the issue of water pollution	32.2	12.4	55.5
19	Awareness of schools' students regarding water pollution should be increased	0.3	0.9	98.8
20	You would like to change the source of drinking water in your house	15.7	10.3	73.9
	Mean percent	**13.96**	**5.56**	**80.41**

The results in table 4.9 show that only 36.6% of the participants believe that domestic water has a good quality and 84.2% believe that there is a water pollution problem in Khanyounis governorate. Also, about 97.6% believe that polluted water can cause harmful diseases to humans, 90.9% believe that mixing of sewage with groundwater must be reduced and 92.4% believe that water pollution can be reduced. About 85.8% believe that quality of water can be improved by using filtration methods, 97.2% believe that legislations to control water pollution should be enacted and 93.6% believe that health education can reduce kidney disease. Almost 98.8% believe that awareness of students regarding water pollution should be increased. In general, the majority of study participants (80.41%) agree on the items of the scale, which indicates positive attitudes toward water pollution.

4.2.3 Practice

Table (4.10): Actions Taken in Case of Water Pollution

Item	Frequency	Percent
In case the water is contaminated at school, does the school administration take any actions to improve the quality of water at school?		
Yes	166	50.3
No	68	20.6
Do not know	96	29.1
What are the measures / actions taken in case there is water pollution in the surrounding area?		
Report to the direct supervisor	163	49.4
Search for the source of pollution	127	38.5
Start meetings with the students and their parents to deal with the problem	16	4.8
No action taken	24	7.3
If no action is taken… why?		

Due to the cost	264	80.0
Lack of knowledge	17	5.2
Lack of cooperation from the supervisors	14	4.2
Others, specify	35	10.6

Table 4.10 above shows that in case of water contamination at school, 50.3% said that the school administration will take an action to improve quality of water, when asked about type of actions taken, 49.4% said that the administration will report the incident to the direct supervisor, 38.5% will search for the source of pollution, 4.8% will start meetings with students and their parents and 7.3% said that no action is taken. In the case of no action is taken regarding water pollution, 80.0% related that to the cost of interventions, 5.2% related that to lack of knowledge and 4.2% to lack of cooperation from supervisors.

Table (4.11): Participation in Waste Disposal

Item	**Frequency**	**Percent**
Do you participate in wastes disposal at school?		
Yes	292	88.5
No	38	11.5
What are the means used for waste disposal?		
Placing wastes in bags and then into the trash cans	38	11.5
Place wastes in municipal garbage containers	199	60.3
Burn or burry wastes in designated places	87	26.4
No action	6	1.8

Regarding participation in waste disposal, table 4.11 shows that 88.5% of the study participants participated in waste disposal at school; of them 11.5% dispose of the wastes in bags and trash cans, 60.3% in municipal garbage containers and 26.45 burn or burry the wastes in designated places.

Table (4.12): Types of Action Taken When Water is Polluted

Item	Frequency	Percent
What is the best practice in case a sudden water contamination happens?		
Inform the supervisor and specify the source of contamination	21	6.4
Keep the students away from the source of water contamination	37	11.2
Raise the students' awareness on the risks of this contamination and methods of treatment	20	6.1
All of the above	252	76.4

Regarding the type of action taken when water is polluted, the above table shows that 6.4% of the study participants said that they would inform the supervisor and specify the source of contamination, 11.2% keep the students away from the source of contamination, 6.1% raise the students' awareness about the risks of contamination and treatment methods and 76.4% take all these actions together.

Table (4.13): Participation in Health Education Sessions about Water Pollution

Item	Frequency	Percent
Have you participated with health educators and counselors in seminars about water pollution?		
Yes	59	17.9
No	271	82.1
If the answer is no, why?		
There were no activities related to this subject	71	21.5
I was not interested about this subject	13	3.9
There was no invitation to participate	187	56.7

Regarding participation in health educations sessions, 82.1% said that they did not participate in any health education sessions regarding water pollution, 21.5% of them

related that to the absence of educational activities about water pollution, 3.9% were not interested in this subject and 56.7% said that they were not invited to attend such sessions.

Table (4.14): Practical Training Regarding Water Pollution

Item	Frequency	Percent
Did you receive a practical training on how to identify the water pollution and its sources?		
Yes	51	15.5
No	279	84.5

Among study participants, 84.5% did not have any practical training about identification of water pollution and its sources.

Table (4.15): Teaching Activities about Water Pollution

Item	Frequency	Percent
Have you discussed the issue of water pollution with your students?		
Yes	172	52.1
No	158	47.9
Have you written about the issue of water pollution at school?		
Yes	106	32.1
No	224	67.9

Regarding teaching activities, 52.1% said that they discussed the issue of water pollution with their students and only 32.1% wrote articles about water pollution.

Table (4.16): Activities to Increase Awareness about Water Pollution

Item	Frequency	Percent
Do you use any of the media tools at school to raise awareness on the issue of water pollution?		
Yes	128	38.8
No	202	61.2
If the answer is yes, what are the available tools?		
Poster and a theater play posters	9	2.8
School broadcasting	41	12.4
Both	87	23.6
Have you coordinated with the municipality to hold a lecture or make a trip to introduce the students to sources of water and pollutants?		
Yes	30	9.1
No	300	90.9
Have you discussed the subject of sewage with the students?		
Yes	134	40.6
No	196	59.4

Regarding activities to raise awareness about water pollution, table 4.16 shows that 38.8% of the participants said that they used media tools; of them 2.8% used posters, 12.4% used school broadcasting and 23.6% used both. Also, only 9.1% said that they coordinated with the municipality for lectures or trips to see sources of water pollution and 40.6% discussed the subject of sewage with their students.

Table (4.17): Discard of Used Water

Item	Frequency	Percent
Do you discard your house's sewage to the street?		
Yes	18	5.5
No	312	94.5
Do you wash your car using large amounts of water?		
Yes	15	4.5
No	315	95.5

The majority of study participants (94.5%) do not discard house sewage in the street and 95.5% used small amount of water to wash their cars.

Table (4.18): Reuse of Waste Water

Item	Frequency	Percent
Do you reuse the grey water (resulting from laundry and washing dishes)?		
Yes	36	10.9
No	294	89.1
Do you reuse the water that was used for laundry and sweeping in farming?		
Yes	43	13.0
No	287	87.0

The majority of study participants (89.1%) do not reuse grey water and 87.0% do not reuse the water that was used for laundry and sweeping in farming.

4.3 Differences in KAP Related to Gender

Table (4.19): Differences in KAP between Male and Female Teachers

Scale	Gender	N	Mean	S. Deviation	t	P value
Knowledge	Male	114	38.42	3.16	-1.593	.112 //
	Female	216	39.03	3.32		
Attitude	Male	114	82.29	5.33	.223	.824 //
	Female	216	82.14	6.31		
Practice	Male	114	30.82	3.12	-2.465	.014 *
	Female	216	31.62	2.59		

* = significant at 0.05 // = not significant

From table 4.19, the results show that there are statistically significant differences in practice at significance level of 0.05 regarding water pollution between male teachers (m =

30.82) and female teachers (m = 31.62), t value = - 2.465 and p-value = 0.014. Differences were not significant in knowledge and attitudes.

The above results indicate that female teachers have better practices about water pollution compared to male teachers.

4.4 Differences in KAP between UNRWA and Governmental School Teachers

Table (4.20): Differences in KAP between UNRWA and Government Teachers

Scale	Employer	N	Mean	S. Deviation	t	P value
Knowledge	UNRWA	208	38.62	3.16	-1.480	.140
	Government	122	39.17	3.43		
Attitude	UNRWA	208	82.43	6.43	.953	.341
	Government	122	81.78	5.12		
Practice	UNRWA	208	31.36	2.85	.168	.867
	Government	122	31.31	2.74		

Table 4.20 shows that there are no statistically significant differences in knowledge, attitudes and practices toward water pollution between UNRWA and government teachers.

4.5 Differences in KAP Related to Age

Table (4.21): Differences in KAP Related to Age Group of Teachers

Scale	Category	Sum of squares	df	Mean square	F	P value
Knowledge	Between groups	70.72	3	23.57	2.222	.085 //
	Within groups	3459.08	326	10.61		
	total	3529.80	329			
Attitude	Between groups	188.99	3	62.99	1.771	.152 //
	Within groups	11593.20	326	35.56		
	total	11782.19	329			
Practice	Between groups	83.31	3	27.77	3.599	.014 *
	Within groups	2515.30	326	7.71		
	total	2598.61	329			

* = significant at 0.05 // = not significant

Table 4.21 shows that there are no statistically significant differences in knowledge and attitudes toward water pollution related to age of the teacher, but differences in practice are significant at 0.05significance level. To find the direction of these differences, Post Hoc Scheffe test was performed. The results are illustrated in table 4.22.

Table (4.22): Mean Difference in Practice among Age Groups

(Post hoc Scheffe test)

Age group	Mean difference	P value
(20 – 30) – (31 – 40)	1.136	.029 *
(20 – 30) – (40 – 41)	.879	.217 //
(20 – 30) – (51 and above)	.206	.983 //

Table 4.22 shows that differences were in favor of age group (20 – 30) years, which means that teachers whose age ranged between 20 – 30 years have better practices toward water pollution compared to other age groups.

4.6 Differences in KAP Related to Years of Experience

Table (4.23): Differences in KAP Related to Experience

Scale	Category	Sum of squares	df	Mean square	F	P value
Knowledge	Between groups	14.83	2	7.41	.690	.502 //
	Within groups	3514.97	327	10.74		
	total	3529.80	329			
Attitude	Between groups	132.91	2	66.45	1.865	.156 //
	Within groups	11649.28	327	35.62		
	total	11782.19	329			
Practice	Between groups	51.32	2	25.66	3.294	.038 *
	Within groups	2547.29	327	7.79		
	total	2598.61	329			

* = significant at 0.05 // = not significant

Table 4.23 shows that there are no statistically significant differences in knowledge and attitudes toward water pollution related to experience of the teacher, but differences in practice are significant at 0.05significance level. To find the direction of these differences, Post Hoc Scheffe test was performed. The results are illustrated in table 4.24.

Table (4.24): Mean Differences in Practice Related to Experience

(Post hoc Scheffe test)

Age group	Mean difference	P value
(less than 5 years) – (6 – 10)	.993	.075
(less than 5 years) – (more than 10)	.662	.150

Table 4.24 shows that teachers who have experience of less than 5 years have better practices compared to other teachers with more experience, but differences were not statistically significant as p-value is slightly higher than 0.05.

4.7 Differences in KAP Related to Qualification

Table (4.25): Differences in KAP Related to Qualification

Scale	Category	Sum of squares	df	Mean square	F	P value
Knowledge	Between groups	.67	2	.33	.031	.969
	Within groups	3529.13	327	10.79		
	total	3529.80	329			
Attitude	Between groups	129.95	2	64.97	1.823	.163
	Within groups	11652.24	327	35.63		
	total	11782.19	329			
Practice	Between groups	6.97	2	3.49	.440	.644
	Within groups	2591.63	327	7.92		
	total	2598.61	329			

Table 4.25 shows that there are no statistically significant differences in knowledge, attitudes and practice toward water pollution among teachers with different qualifications.

4.8 Discussion

Knowledge

Concerning the general knowledge regarding water pollution, the results showed that 95.5% of the study participants have knowledge about water pollution. This result agrees with a previous study conducted in Gaza which revealed a moderate level of environmental knowledge where 70.2% of school aged children have environmental awareness (Sarsour, 2007). On the other hand, the results of this study disagreed with the results of a study conducted on secondary school teachers in Nigeria, which revealed a lower level of environmental knowledge among teachers (EER, 2002). Another study conducted in Gaza Strip showed that students have a low level of environmental enlightenment (Afifi, 2000).

Also a comparative study on environmental awareness among secondary school students in Iran and India showed a low level of environmental awareness in Iran (14.9%) and in India (44.0%) (Shoberi, 2007). Also the study carried out in Vietnam by Nguyen (2001) showed that primary school teachers have low level of knowledge about environment and need more follow up and training to increase their awareness about environment. Also, the study of Larijani (2010) showed that only 24.3% of schoolteachers have high level of environmental awareness.

These variations in environmental knowledge could be attributed to cultural differences, believes and the educational system. In this study 87.9% of participants said that they got their knowledge about environment during their study at school or university.

The majority (99.4%) of the study participants know that polluted water causes health problems and 95.8% believe that water pollution may cause kidney disease and hepatitis and 83.6% of study participants think that there is a relationship between diarrhea and water pollution. These results agree with those of a study conducted in Gaza which showed that contamination of water with fecal coliform had exceeded the WHO limit for water wells and networks and those diarrhea diseases were strongly correlated with fecal coliform contamination in water network (Abu Amer and Yassin, 2006). The report published by Al Mezan Centre for Human Rights (2009) on "Environmental Pollution and Sanitation Problems in Khanyounis" highlighted the serious water, health and environmental problems faced by the inhabitants of Khanyounis town due to the exacerbating sanitation situation. Also, the study conducted by Abu Maila, et al (2004) showed that nitrate represents one of the major pollutants of groundwater in the Gaza Strip where several cases of blue baby’s disease were reported in the previous couple of years of the study.

Attitudes

The results of this study showed that only 36.6% of the study participants believed that domestic water is of good quality and 84.2% believed that there is a water pollution problem in Khanyounis governorate, 97.6% believed that polluted water can cause harmful diseases to humans, 90.9% believe that mixing of sewage with groundwater must be reduced and 92.4% believed that water pollution can be reduced. These results agree with Abu Safieh (1993) results which showed that pollution of the groundwater is a major problem in GS and the aquifer is highly vulnerable to pollution. The domestic water is becoming more saline every year and its average concentration reached more than 500mg/l. Also, most of the public drinking water supply wells have high salinity concentrations.

The results of this study showed that 93.6% of the study participants believe that health education can reduce kidney disease and 98.8% believe that awareness of students regarding water pollution should be increased. These results agree with the results of a study conducted in Hong Kong which showed that the teachers tend to teach more environmental education if they hold more favorable attitude toward environmental education, had more skills of teaching environmental education and believed more in the relevance of integrated science to environmental education (Chi-Chung and Lee, 2003). In contrast, the study conducted by Sarsour (2005) in Gaza city revealed that students had low positive attitude toward the environment. The above results revealed differences in attitude toward environment which could be attributed to cultural variations and differences among the participants of the studies.

In general, the majority of the study participants have positive attitudes toward water pollution. This result can be attributed to teaching environmental issues at schools, the high

level of awareness toward environment and the need to improve the quality of environment for the safety of the community.

Practice

The results of this study showed that the majority of study participants (88.5%) participated in waste disposal at school. On the other hand, the results showed a lower level of participation in other activities regarding environment where only 17.9% participated with health educators and counselors in seminars about water pollution and 82.1% have never shared in such activity. Among the study participants, 56.7% reported that they were not invited to attend any session regarding water pollution. Also, 84.5% did not have any practical training about identification of water pollution and its sources, but 52.1% said that they discussed the issue of water pollution with their students and only 9.1% of the study participants coordinated with the municipality for lectures or trips to see sources of water pollution and 40.6% discussed the subject with their students. The results of Chi-Chung and Lee (2003) on teachers' perceptions of environmental education indicated that the variations in the teaching of environmental education were reflected by teachers' emphasis on teaching environmental education, their use of variety of teaching methods and their regular practice of extracurricular activities on environmental education. The results of Palmburg and Kuru (2000) demonstrated increased knowledge and attitudes toward the environment, but lack the motivation and /or problem solving skills to take action.

KAP and gender

The results of this study revealed that female teachers have better practices about water pollution compared to males, but there were no differences in knowledge and attitudes.

These results agree with that of NEETF (1998) which showed that 74.0% of women favor the environment compared to 68.0% of men, but men have a higher knowledge compared to female (69.0% and 31.0% respectively). On the other hand, the results of this study disagree with the results of Sarsour (2005) which showed that the level of awareness and attitude was higher among male school children. Also, the results of Gambro and Switzky (1994) showed that 44.0% of male students and 29.2% of female have a satisfactory knowledge about pollution issues. Also, the results of this study did not show significant differences in knowledge regarding environment between male and female teachers. This result disagrees with the results of Palmer (2001) which revealed that male respondents have more knowledge regarding environmental issues than females. Another study showed that males scored higher in environmental knowledge than females (Gayford, 1996). In a study on environmental awareness and environmental attitudes of secondary school teachers and students conducted in Rajasthan, the results showed that female students possessed significantly more awareness than males (Shahnawaj, 1990), while opposite results were reported by Tripathi (2000) were boys have better awareness than girls. Also, the results of Larijani (2010) reported that females have higher level of environmental awareness compared to males.

Some studies reported that there are no significant differences between the two genders in terms of science and environmental education. One study about influential factors of learning environment showed that gender was not one of the top three factors related to attitudinal outcomes (Henderson, et al., 1998). Similarly, there has been no evidence to indicate that there are significant differences in perception between the sexes related to environment, the one main difference identified, however is career choice; females are less likely to choose environmental science than males (Newsom-Stewart and Stuphin, 1994).

KAP and type of school

The results of this study showed that there were no statistically significant differences in knowledge, attitudes and practices toward water pollution between UNRWA and government primary school teachers. These results disagree with those of Afifi (2000) which showed that UNRWA school teachers have a higher KAP compared to governmental school teachers. This result is in contradiction with those of Larijani (2010) which revealed that private school teachers have a higher environmental awareness compared to governmental school teachers. Dinakara (2000) reported significant differences in environmental awareness between government and private school teachers. On the other hand, Sabholk (1995) reported that government school teachers have higher environmental awareness compared to nongovernmental school teachers.

KAP and age

The results of this study showed that there are no statistically significant differences in knowledge and attitudes toward water pollution related to age of the teacher, but differences are significant in practice, as younger teachers whose age ranged between 20 – 30 years have better practices toward environment. These results disagree with the results of Larijani (2010) which showed that teachers of age group 31 – 50 years old have a higher environmental awareness compared to teachers with age group less than 30 years.

KAP and years of experience

The results showed that there are no statistically significant differences in knowledge and attitudes toward water pollution related to experience of the teacher, but differences are significant in practice, where teachers who have experience of less than 5 years have better practices compared to other teachers with more experience. The study of Swain (2010)

which was conducted in Missouri showed that the years of teaching experience did not make a difference in their need for environmental education training. Also, the results of Shoberi (2007) showed that there were no significant differences in the level of environmental awareness of teachers with different lengths of teaching experience. Also, the findings of Peal (1995) showed that the experience of teachers did not play an important role on the environmental awareness.

KAP and qualification

The results of this study showed that there are no statistically significant differences in knowledge, attitudes and practice toward water pollution among teachers with different qualifications. This result disagrees with that of Sarsour (2005) which showed that there was a direct relation between environmental awareness and attitudes and students' grade. On the other hand, the results of Shoberi (2007) showed that the level of environmental awareness of science teachers were rated high compared to arts teachers.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

This study was conducted to examine the level of knowledge, attitude and practice among primary school teachers towards water pollution in Khanyounis governorate. The study explored levels of KAP in relation to some demographic variables including gender, age, years of experience and school type (UNRWA and government). The results of the study highlighted the need to adopt environmental education in school curricula in order to increase awareness toward environment.

Knowledge Regarding Water pollution

In general, primary school teachers in Khanyounis governorate have high level of knowledge of environmental issues. Among study participants, 95.8% were found to have knowledge regarding water pollution, 95.2% believe that waste water is one of the sources of water pollution and 99.4% knew that polluted water can cause diseases to humans. This finding reveled that the vast majority of study participants have knowledge about water pollution and its harmful effects on human beings.

Also, the results showed that 72.4% of the study participants have some knowledge about environmental sciences; 65.8% considered environmental education as part of school curriculum and 43.3% of study related water pollution to lack of community awareness. This result highlighted the need to increase environmental awareness through formal and informal education.

Attitude Regarding Water pollution

The primary school teachers in Khanyounis governorate have generally high level of positive attitudes toward water pollution. The mean percentage was 80.41 among the study participants that has positive attitude. Also, 90.9% believe that mixing of sewage with groundwater must be reduced, 92.4% believed that water pollution can be reduced, 85.8% believed that quality of water can be improved by using filtration methods, 97.2% believed that legislations to control water pollution should be enacted and 98.8% believed that awareness of students regarding water pollution should be increased.

Practice regarding water pollution

Although the study participants have high knowledge and positive attitudes toward water pollution and environment, the level of practice was low. Regarding participation in health education sessions, only 17.9% participated in health education sessions; of them 21.5% related that to the absence of educational activities about water pollution, 3.9% were not interested in this subject and 56.7% said that they were not invited to attend such sessions. Also, 84.5% did not have any practical training about identification of water pollution and its sources.

These results indicate the need to raise the level of practice toward environmental issues. This can be attained through some activities such as outdoor trips to public parks, natural resources, water resources and educational sessions inside and outside the school.

KAP related to demographic variables

The results showed that female teachers have better practices about water pollution compared to male teachers. This result could be attributed to the fact that women innately have more concern about water safety and precautions. Also, the results showed that there

are no differences in knowledge, attitudes and practices toward water pollution between UNRWA and government school teachers.

There are no significant differences in knowledge and attitudes toward water pollution related to age of the teacher, but differences were significant in practice, as teachers whose age ranged between 20 – 30 years have better practices toward water pollution compared to other age groups. Also, there are no significant differences in knowledge and attitudes toward water pollution related to years of experience, but differences were significant in practice. There are no significant differences in knowledge, attitudes and practice toward water pollution between teachers with different qualifications.

5.2 Recommendations

- Establish special educational programs and prepare learning materials that well suit the purpose of water protection and development.
- Organize regular training programs and seminars to discuss the problems of the environmental pollution in general and water pollution in particular.
- Encourage outdoor trips to visit water sources, wastewater treatment plants and natural parks.
- Use the media to highlight the importance of the environment as a natural resource for the community.
- Coordinate activities regarding environment with municipality and community institutions.
- Arrange for voluntary days to share in cleaning of roads and natural resources in the community.

5.3 Suggestions for Further Research

- Conduct research studies regarding KAP about environment among different target groups from different ages, including students, workers and other professionals.
- Conduct a research study regarding the relationship between environmental pollution and congenital anomalies.
- Carry out surveys about the safety of reusing waste water in agriculture.

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Annex (1)

23

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

التاريخ7/6/2010

Name:

الاسم: ميساء نبيل أبو موسى

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

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

Knowledge, attitudes and practices of primary school teachers about water pollution in Khanyounis Governorates.

In its meeting on June 2010

و ذلك في جلستها المنعقدة اشهر 6 2010

and decided the Following:-

و قد قررت ما يلي:-

To approve the above mention research study.

الموافقة على البحث المذكور عاليه.

Signature
توقيع

Member
عضو

Member
عضو

Chairperson

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.

Annex (2)

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

2010/8/1

الأخ/د. محمود الحمضيات المحترم
مدير التربية و التعليم –بوكالة الغوث غزة

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالبة ميساء أبو موسى

تقوم الطالبة المذكورة أعلاه بإجراء بحث بعنوان:

"Knowledge,attitudes and practices of primary school teachers about water pollution in Khanyounis Governorate"

كمتطلب للحصول على درجة الماجستير في الصحة العامة –مسار صحة بيئة و عليه نرجو التكرم للإيعاز لمن ترونه مناسب لتسهيل مهمة الطالبة في جمع البيانات اللازمة من مدرسين المرحلة الابتدائية بمدارس الوكالة التابعة لإدارتكم الموقرة.
علماً بأن المعلومات ستكون متوفرة لدى الباحث و الجامعة فقط.

و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد
منسق عام برامج الصحة العامة

نسخة: الملف

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Annex (3)

Palestinian National Authority
Ministry of Education & Higher Education
Deputy Minister's Office

السلطة الوطنية الفلسطينية
وزارة التربية والتعليم العالي
مكتب وكيل الوزارة

الرقم: و ت غ (مذكرة داخلية) / ١٠٩٦
التاريخ: 2010/9/14م
الموافق: 5/ شوال/1431هـ

السيدة/ مدير التربية والتعليم بمديرية خان يونس حفظها الله.

السلام عليكم ورحمة الله وبركاته،،،

الموضوع: تسهيل مهمة

نهديكم أطيب التحيات، وبالإشـارة إلى الموضوع أعلاه يرجى تسهيل مهمة الباحثة "**ميساء نبيل أبو موسى**"، والتي تجري بحثاً بعنوان: "**مدى معرفة اتجاه وممارسات مدرسي المرحلة الابتدائية عن تلوث الماء بمدينة خانيونس**"، في تطبيق أدوات البحث على عينة من معلمي المرحلة الابتدائية، وذلك حسب الأصول.

وتفضلوا بقبول فائق التقدير والاحترام

د. زياد محمد ثابت
الوكيل المساعد للشئون التعليمية

أسماء مدارس طلب تسهيل ...

١- طارق بن زياد الأساسية
٢- طارق بن زياد الثانوية
٣- حاتم الطائي الأساسية المختلطة
٤- عبد الله صيام الأساسية
٥- عبد الله أبو ستة الأساسية ب

لا مانع من السماح لها بتطبيق أدوات البحث

Annex (4)

موافقة إجراء استبيان حول دراسة المعرفة والتوجهات والمواقف لدى مدرسى المرحلة الابتدائية المتعلقة بتلوث الماء بمحافظة خانيونس

أنا الطالبة ميساء أبو موسى ملتحقة ببرنامج ماجستير الصحة العامة - مسار البيئة - بجامعة القدس، أبو ديس، واستكمالا لمتطلبات البرنامج يجب تنفيذ هذا البحث لتقديمه كأطروحة التخرج لنيل درجة الماجستير وهو بعنوان (المعرفة والتوجهات والممارسات حول تلوث المياه لدى معلمي المرحلة الابتدائية بمحافظة خانيونس).

وأداة الدراسة هذه الاستبانة الموضوعة بين أيديكم ,حيث يستغرق زمن تعبئتها 20 دقيقة ,علما بأن كافة المعلومات التي سيتم جمعها ستستخدم فقط للغرض العلمي وستبقى سرية.

المشاركة بتعبئة الاستبانة طوعية، مع العلم أنه لا توجد إجابات خاطئة ولكن إجابتك تعبر عن رأيك الشخصي.

شاكرين لكم حسن تعاونكم ،،،

الباحثة

ميساء أبو موسى

توقيع المدرس .....

Annex (5)

استبيان حول التعرف على مدى المعرفة والاتجاهات والممارسات المتعلقة بتلوث الماء لدى مدرسي المدارس الابتدائية في محافظة خانيونس

أولاً : معلومات شخصية

1- الرقم المسلسل

3- العمر : ..... سنة

4- الجنس : □ ذكر □ أنثى

5- الحالة الاجتماعية : □ متزوج □ أعزب □ مطلق □ أرمل

6- المدرسة: □ وكالة □ حكومة

7- المؤهل العلمي : □ دبلوم متوسط □ بكالوريوس □ دراسات عليا

8- عدد سنوات الخبرة بمجال التعليم: □ 5 سنوات فاقل □ 6 -10 سنوات □ أكثر من 10 سنوات

10- هل حصلت على دورات تدريبية في مجال الصحة أو البيئة؟

□ نعم □ لا

أولاً: المعرفة

1- هل تعرف عن تلوث الماء؟

□ نعم □ لا

2- إذا كانت الإجابة بنعم هل حصلت على هده المعلومات حول تلوث الماء أثناء الدراسة في مراحل المدرسة والجامعة؟

□ نعم □ لا

3- تعريف تلوث الماء هو تغير في الصفات الطبيعية والكيماوية والبيولوجية للماء أو إضافة مواد غريبة تتسبب في تعكير الماء وتكسبه لون أو طعم أو رائحة حيث يصبح الماء غير مناسب للكائنات الحية؟

□ نعم □ لا

4- -هل المياه الملوثة تسبب أمراض للإنسان؟

□ نعم □ لا

5- إذا كانت الإجابة بنعم هل تلوث الماء يسبب الإصابة بأمراض الكلى و التهاب الكبد الوبائي A&E

□ نعم □ لا

6- برأيك يعتبر الصرف الصحي من ملوثات المياه؟

□ نعم □ لا

7 - هل تعتقد بوجود علاقة بين الإسهال وتلوث الماء؟

□ نعم □ لا □ لا اعرف

8-هل تعتقد بوجود علاقة بين تلوث الماء وزيادة نسبة دخول المستشفى؟

□ نعم □ لا □ لا اعرف

9-هل تعتقد بوجود علاقة بين تلوث الماء ونسبة الوفيات؟

□ نعم □ لا □ لا اعرف

10-هل تعلم شيء عن علوم البيئة؟

□ نعم □ لا □ لا اعرف

11-هل التعليم البيئي جزء من المنهاج الدراسي في المدارس الابتدائية؟

□ نعم □ لا □ لا اعرف

12-هل تعلم بوجود أي قوانين لحماية البيئة؟

□ نعم □ لا □ لا اعرف

13--ما هي الأسباب التي تدفع الإنسان لتلويث الماء؟

□ قلة الوعي المجتمعي حول البيئة .

□ أسباب تتعلق بثقافة الشخص

□ عدم وجود سياسات بيئية واضحة المياه العادم

المياه العادمة :

14- هل توجد شبكة مجاري في منطقتك؟

□ نعم □ لا

15- في حال عدم وجود شبكة مجاري في منطقتك هل المجاري مفتوحة هي آلية التخلص من المياه العادمة؟

□ نعم □ لا

16- في حال عدم وجود شبكة مجاري في منطقتك هل وجود بئر امتصاص هي آلية التخلص من المياه العادمة لديك؟

□ نعم □ لا

مصادر المياه :

17- ما هو مصدر مياه الشرب؟

□ البلدية □ وكالة غوث □ مياه مباعة

18- ما هو متوسط المياه التي تشربها يوميا؟

□ اقل من 3 لتر □ أكثر من 3 لتر

19- هل كانت المياه التي تشربها تعالج مند عشر سنوات؟

□ نعم □ لا

20- هل يتم حاليا معالجة مياه الشرب في المنزل قبل الاستعمال؟

□ نعم □ لا

21. إذا كانت الإجابة نعم هل الفلتر هي الوسيلة المستخدمة حاليا؟

□ نعم □ لا

22- هل يتم استعمال مياه الشرب في الطبخ؟

□ نعم □ لا

الخزانات

23- هل يوجد خزانات للمياه بمنزلك؟

□ نعم □ لا

24- ما هو نوع خزانات المياه في المنزل؟

□ بلاستك اسود

□ بلاستيك ابيض

□ صفيح

25- هل خزانات المياه مقفلة جيدا في منزلك؟

□ نعم □ لا

26- هل لاحظت وجود شوائب أو طحالب أو ترسبات في خزانات المياه بالمدرسة أو البيت؟

□ نعم □ لا

27- برأيك ما هي أسباب ملوثات خزانات مياه الشرب؟

□ الرواسب أو العكارة ووجود المياه الساكنة لمدة طويل

□ عدم نظافة الخزان وعدم إحكام غلقه.

□ كل ما سبق ذكره

28- كم عدد مرات التنظيف لخزانات المياه البيتية في السنة

□ 2-1
□ 4-3
□ أكثر من

ثانياً: الاتجاهات نحو تلوث المياه

الرجاء اختيار درجة الموافقة على الفقرات التالية حسب رأيك:

م	الفقرة	موافق بشدة	موافق	لا رأي لي	غير موافق	غير موافق بشدة
1	المياه التي تصل إلى المنزل جيدة من حيث النوعية					
2	المياه التي تصل إلى المنزل كافية من حيث الكمية					
3	توجد مشكلة تلوث ماء بمحافظة خانيونس					
4	اعتقد أن تلوث الماء يسبب أمراض تضر بصحة الإنسان					
5	تلوث الماء الجوفي يؤثر على صحة المجتمع					
6	اختلاط مياه المجاري بالمياه الجوفية يؤدي بالضرر على صحة الإنسان					
7	مياه الأمطار الحامضية لا تؤثر على جودة المياه الجوفية					
8	اعتقد انه يجب الحد من خلط مياه المجاري بالمياه الجوفية					
9	تلوث الماء يمكن الحد منه					
10	يمكن السيطرة على ملوحة المياه في المنزل (باستخدام وسائل تنقيه)					
11	يمكن تحسين صفات وجودة المياه في المنزل من حيث النقاء والشفافية باستخدام وسائل تنقية)					
12	يمكن الحفاظ على استمرارية وجود مياه نقية للشرب طوال اليوم					
13	اعتقد انه من الضرورى معاقبة الدين يسببون تلوث الماء حسب القانون					
14	من الضروري وجود أدوات خاصة للتعامل مع تلوث الماء					
15	من الضروري التعاون مع اللجان المختصة بمجال تلوث الماء					
16	من الواجب عمل قوانين وتشريعات للحد من تلوث الماء					
17	للتثقيف الصحي دور فعال للحد من مرض الفشل الكلوي					
18	وسائل الإعلام تتحدث عن مشكلة تلوث الماء					
19	يجب زيادة توعية طلبة المدارس حول موضوع تلوث الماء					
20	ترغب بتغيير مصدر مياه الشرب في منزلك					

ثالثاً: الممارسات:

1-هل تقوم المؤسسة التعليمية باجرات لتحسين جودة الماء في حالة حدوث تلوث ماء بالمدرسة:
□ نعم □ لا □ لا اعرف

2- إذا كانت الإجابة بنعم ما هي الإجراءات التي تتخذها في حالة وجود مصدر تلوث ماء بالبيئة المحيطة:
□ إبلاغ المسئول المباشر
□ الذهاب إلي مصدر التلوث ومعرفته
□ عقد لقاءات مع الطلبة و أهاليهم لمعالجة المشكلة

3- إذا كانت الإجابة لا, لماذا ؟
□ التكلفة □ نقص معرفة □ عدم تعاون المسئولين

4- هل تشارك بالتخلص من النفايات بالمدرسة؟
□ نعم □ لا

5- إذا كانت الإجابة بنعم , ما هي الوسيلة؟
□ وضعها بأكياس خاصة(سلة القمامة)
□ وضعها بحاوية البلدية
□ حرقها أو دفنها بأماكن مختصة

6-ما هي أفضل إجراء في حالة حدوث تلوث ماء طارئ؟
□ إبلاغ المسئولين و معرفة مصدر التلوث.
□ إبعاد الطلبة عن مصدر تلوث الماء.
□ توعية الطلبة بمخاطر هدا التلوث و طرق معالجته.
□ جميع ما سبق.

7- هل شاركت مع مرشدين ومثقفين صحيين في ندوات حول تلوث الماء:
□ نعم □ لا

8- إذا كانت الإجابة لا فلماذا؟
□ لم تكن نشاطات حول هدا الموضوع
□ عدم الاهتمام بهذا الموضوع
□ لم تكن هناك دعوة للمشاركة.

9- هل تدربت عمليا كيف تتعرف على تلوث الماء و مصادره:
□ نعم □ لا

10- هل ناقشت موضوع تلوث الماء مع الطلبة:
□ نعم □ لا

11- هل كتبت عن موضوع تلوث الماء في المدرسة؟
□ نعم □ لا

12- هل تستخدم أيا من الوسائل الإعلامية للتوعية في مجال تلوث الماء بالمدرسة ؟
□ نعم □ لا

13- إذا كانت الإجابة بنعم فمادا يوجد ؟

□ بوستر و نشرة مسرحية
□ إذاعة مدرسية
□ كل ما سبق

14-هل قمت بالتنسيق مع البلدية للقيام بمحاضرة أو رحلة تعريفية للطلبة عن مصادر الماء ومصادر تلوثه؟

□ نعم □ لا

15- هل ناقشت موضوع مياه المجارى مع الطلبة ؟

□ نعم □ لا

16-هل تسكب مياه المجاري الخاصة ببيتك بالشارع؟

□ نعم □ لا

17-هل تغسل سيارتك الخاصة بكمية ماء كبيرة؟

□ نعم □ لا

18-هل تقوم بإعادة استخدام مياه الغسيل و الجلي ؟

□ نعم □ لا

19-هل تستخدم مياه الغسيل والشطف بالزراعة؟

□ نعم □ لا

Annex (6)

Knowledge, Attitudes and Practices of Primary Schools' Teachers in Khan Younis Governorate related to Water Pollution

1. **Questionnaire no.**: ……..

Socio Demographic Data

2. **Age:** …… years
3. **Sex:** Male □ □ Female
4. **Marital Status:** Married □ Single □ Divorced □ Widow/Widower
5. **School type:** UNRWA school □ governmental school □
6. **Respondent's qualification:** Intermediate diploma □ BA/B.Sc. □ Graduate student □
7. **Years of experience in the education field:**

equal or less than 5 years □ 6-10 years □ more than 10 years □.

8. **Have you received any training courses in the field of health or environment?**

□ Yes □ No

I: Measurement of Knowledge

1) **Do you know about water pollution?**

□ Yes □ No

2. If your answer is yes, did you get that knowledge about water pollution during your school and university study?

□ Yes □ No

3. **Water Pollution is defined as (a change in the physical, chemical and biological characteristics of water or adding any materials which can cause disturbance in water and gain it color, taste or smell which make it unsuitable for living creatures)?**

□ Yes □ No

4. Can polluted water cause diseases to humans?

□ Yes □ No

5. If your answer is yes, does water pollution cause kidney diseases and hepatitis A&E?

□ Yes □ No

6. In your opinion, waste water is one of the sources of water pollution?

□ Yes □ No

7. Do you think there is a relationship between diarrhea and water pollution?

□ Yes □ No □ I do not know.

8. Do you think there is a relationship between water pollution and the increase in frequency of hospitalization?

□ Yes □ No □ I do not know.

9. Do you think there is a relationship between water pollution and mortality rate?

□ Yes □ No □ I do not know.

10. Do you have some knowledge about environmental sciences?

□ Yes □ No □ I do not know.

11. Is the environmental education considered part of the curriculum in primary schools?

□ Yes □ No □ I do not know.

12. Do you know of any legislation for protecting the environment?

□ Yes □ No □ I do not know.

13. In your opinion, what causes the humans to pollute water?

a. Lack of community awareness about the environment.
b. Causes related to the individual's education.
c. Absence of clear environmental policies related to waste water.

Background data:

a. The sewage network:

14. Is there a sewage network in your residential area?

□ Yes □ No

15. In the absence of a sewage network in your residential area, are open sewers used as a mechanism for the disposal of waste water?

□ Yes □ No □ Not applicable

16. In the absence of a sewage network in your residential area, are septic tanks used as a mechanism for the disposal of waste water?

□ Yes □ No □ Not applicable

b. Water resources:

17. What is the source of drinking water?

Municipality □ UNRWA □ sold water □

18. In average, how much water do you drink every day?

More than 3 liters □ less than 3 liters □

19. Was the water you used to drink 10 years ago treated?

□ Yes □ No

20.Do you currently treat water in the house before use?

□ Yes □ No

21.If the answer is yes, is the water filter what you use now?

□ Yes □ No □ Not applicable

22. Is potable water used in cooking?

□ Yes □ No

c. Tanks:

23. Do you have water tanks in your house?

□ Yes □ No

24. What is the type of water tanks you have in your house?

□ Black plastic tanks

□ White plastic tanks

□ Tin tanks

□ Not applicable, I do not have water tanks in house. [Please move to q. 24]

25. Are the water tanks closed well in your house?

□ Yes □ No

26. Have you noticed the presence of impurities, sediments or algae in water tanks at school or in the house?

 Yes No

27. In your opinion, what are the causes of polluting drinking water tanks?

 The existence of sediments or turbidity and having stagnant water for long periods of time

 The tank is not clean and is not closed well

 All of above

28. How many times do you clean the water tank at home per year?

 1-2 times

 3-4 times

 More than 5 times

II: Measurement of Attitudes
Chose from below what best presents your attitude towards the following statements:

No.	Item	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	Domestic water has a good quality					
2	Domestic water is sufficient					
3	There is a water pollution problem in Khan Younis Governorate					
4	I believe that polluted water can causes harmful diseases to humans					
5	Pollution of ground water can affect the community's health					
6	Mixing of groundwater with sewage can harm the humans' health					
7	Acidic rain does not affect the quality of groundwater					
8	I believe that mixing of sewage with groundwater must be reduced					
9	Water pollution can be reduced					
10	Salinity of water in the house can be controlled (By using filtration methods)					
11	The specifications and quality of water in the house can be improved in terms of clarity and transparency through using filtration methods					
12	continuation the present of filtered water for drinking all the day can be maintained					
13	I believe it is important to penalize who pollute water based on the laws					
14	It is important to have the proper tools to handle water pollution					
15	It is important to cooperate with the competent					

	committees in the field of water pollution					
16	It is important to enact laws and legislation to control water pollution					
17	Health education has an important role in reducing the kidney failure disease					
18	Mass media discusses the issue of water pollution					
19	Awareness of Schools' students regarding water pollution should be increased					
20	You would like to change the source of drinking water in your house					

III. Measurement of Practices:

1. **In case the water is contaminated at school, does the school administration take any measures to improve the quality of water inside the school?**

□ Yes □ No □ I do not know

□ There have been no reported cases

2) If your answer is yes, what are the measures taken in case there is water pollution in the surrounding area?

Report to the direct supervisor

□ Search for the source of pollution

□ Holding meetings with the students and their parents to handle the problem.

□ No action taken. [Move to question 59]

3) If your answer is no, why?

□ Due to the cost

□ Lack of knowledge

□ Lack of cooperation from the supervisors

□ Other, specify ……

4) Do you participate in wastes disposal at school?

□ Yes □ No

5) If the answer is yes, what are the means used?

□ Placing wastes in bags and then into the trash cans.

□ Place wastes in municipal garbage containers. .

□ Burn or burry wastes in designated places.

□ No action.

6) What is the best practice in case a sudden water contamination happens?

□ Inform the supervisor and specify the source of contamination.

□ Keep the students away from the source of water contamination.

□ Raise the students' awareness on the risks of this contamination and methods of treatment.

□ All of the above

7) Have you participated with health educators and counselors in seminars about water pollution?

□ Yes □ No

8) If the answer is no, why?

□ There were no activities related to this subject

□ I was not interested about this subject

□ There was no invitation to participate.

9) Did you receive a practical training on how to identify the water pollution and its sources?

□ Yes □ No

10) Have you discussed the issue of water pollution with your students?

□ Yes □ No

11) Have you written about the issue of water pollution at school?

□ Yes □ No

12) Do you use any of the media tools at school to raise awareness on the issue of water pollution?

□ Yes □ No

13) If the answer is yes, what are the available tools?

□ Poster and a theater play posters

□ School broadcasting

□ both

14) Have you coordinated with the municipality to hold a lecture or a trip to introduce the students to sources of water and pollutants?

□ Yes □ No

15) Have you discussed the subject of sewage with the students?

□ Yes □ No

16) Do you discharge your house's sewage to the street?

□ Yes □ No

17) Do you wash your car using large amounts of water?

□ Yes □ No

18) Do you reuse the grey water (resulting from laundry and washing dishes)?

□ Yes □ No

19) Do you reuse the water that was utilized for laundry and sweeping in farming?

□ Yes □ No

Thank you for your cooperation

ملخص الدراسة

كانت هذه الدراسة بعنوان "مدي المعرفة والاتجاهات والممارسات اتجاه تلوث المياه لدى معلمي المرحلة الابتدائية بمحافظة خانيونس" وهدفت هذه الدراسة إلى تحديد مستوى المعرفة والاتجاهات والممارسة لدى معلمي المدارس الابتدائية (وكالة وحكومة) المتعلقة بتلوث المياه في محافظة خانيونس وعلاقتها بكل من الجنس ونوع المدرسة والمؤهلات وسنوات الخبرة.

تكونت عينة الدراسة من 330 معلم ومعلمة (208 وكالة و 122 حكومة) من 15مدرسة تم تحديدها من قبل مديرية التربية والتعليم الحمومية ودائرة التعليم بالوكالة في محافظة خانيونس، حيث تم اختيار جميع المعلمين العاملين في تلك المدارس المختارة.

وقد استخدمت الباحثة المنهج الوصفي في دراستها، ولجمع البيانات استخدمت الباحثة استبانة صممت لقياس مستوى المعلومات والاتجاهات والممارسة، وقد تم التأكد من صدق وثبات أداة الدراسة من خلال تطبيقها على عينة استطلاعية تكونت من 30 معلم ومعلمة تم اختيارهم بشكل عشوائي.

لتحليل البيانات استخدمت الباحثة برنامج الرزم الإحصائية للعلوم الاجتماعية (SPSS version 13)، وقد استخدمت الباحثة المعالجات الإحصائية التالية: التكرارات، النسب المئوية، المتوسطات، اختبار (ت)، اختبار تحليل التباين الأحادي واختبار بيرسون للعلاقات.

أظهرت نتائج الدراسة أن النسبة العامة للمعرفة حول تلوث المياه لدى المعلمين الذين شاركوا في الدراسة بلغت 81.7%، كما بينت النتائج أن 95.8% منهم لديهم معرفة بمشكلة تلوث المياه، 95.2% يعتقدون أن المياه العادمة هي أحد مصادر تلوث المياه و 99.4% يعرفون أن المياه الملوثة تسبب الأمراض للإنسان. كما بينت النتائج أن 72.4% من أفراد عينة الدراسة لديهم بعض المعرفة حول العلوم البيئية، 65.8% يرون أن التعليم البيئي مدمج في المناهج الدراسية، 43.3% يعزون تلوث المياه إلى قلة الوعي بين أفراد المجتمع.

وبينت النتائج وجود اتجاهات إيجابية لدى أفراد عينة الدراسة حول مشكلة تلوث المياه بنسبة عامة بلغت 80.41%، وأفاد 90.9% بضرورة الحد من اختلاط مياه المجاري بالمياه الجوفية، 92.4% يعتقدون بإمكانية الحد من المياه الملوثة، 85.8% يرون إمكانية تحسين جودة المياه من خلال

استخدام الفلاتر، ويرى 97.2% بضرورة تفعيل القوانين ذات العلاقة بالبيئة للحد من مشكلة تلوث المياه، 98.8% يرون ضرورة رفع مستوى الوعي البيئي لدى طلبة المدارس.

بالنسبة للممارسة، فقد أفاد 17.9% من أفراد عينة الدراسة بأنهم شاركوا في محاضرات أو برامج تعليمية حول البيئة بينما أفاد 82.1% بأنهم لم يشاركوا في أي محاضرة أو برنامج وقد عزا 21.5% منهم ذلك إلى عدم وجود أنشطة تعليمية تختص بالبيئة في مدارسهم، 3.9% لم يبدوا اهتمامهم بمواضيع البيئة، 65.7% لم تتم دعوتهم للحضور أو المشاركة في أي نشاط تعليمي خاص بالبيئة.

وبينت النتائج أن مستوى الممارسة البيئية لدى المعلمات كان أعلى لديهن من المعلمين. وبينت النتائج عدم وجود فروق ذات دلالة إحصائية في مستوى المعرفة، الاتجاهات والممارسة حول تلوث المياه بين المعلمين العاملين في مدارس وكالة الغوث والمعلمين العاملين في المدارس الحكومية. أيضاً لم توجد فروق ذات دلالة إحصائية في مستوى المعرفة والاتجاهات حول تلوث المياه تعزى إلى عمر المعلم ولكن وجدت فروق دالة إحصائياً في مستوى الممارسة لصالح المعلمين من الفئة العمرية (20 – 30 سنة). أيضاً لم توجد فروق ذات دلالة إحصائية في مستوى المعرفة والاتجاهات تعزى إلى سنوات الخبرة ولكن وجدت فروق دالة إحصائياً في مستوى الممارسة لصالح المعلمين الذين لديهم خبرة أقل من 5 سنوات. كما بينت النتائج عدم وجود فروق ذات دلالة إحصائية في مستوى المعرفة والاتجاهات والممارسة حول تلوث المياه تعزى للمؤهل العلمي.

وبشكل إجمالي، فقد بينت نتائج الدراسة وجود مستوى عالي في بعدي المعرفة والاتجاهات بينما كان المستوى متدني في بعد الممارسة حول تلوث المياه في محافظة خانيونس، كما أظهرت الحاجة إلى رفع مستوى الوعي البيئي من خلال الأنشطة التعليمية الرسمية وغير الرسمية.