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Risk Factors of Hypothyroidism among Palestinian in Gaza Strip: Case Control Study

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Thesis Approval

Risk Factors of Hypothyroidism Among Palestinian In Gaza Strip: Case Control Study

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Dedication

To the loving memory of my father, God bless his soul

To my precious mother

To my brother; Mr. Mohammad, Dr. Abdellrahman, and Mr. Ahmad

To my sister

To my wife

To my son Ibrahim

To my daughters Shtha, Basma, and Raghad

To my relative and friends

Declaration

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

Signed

Khalil Ibrahim Hamad

Date: / /

Acknowledgment

First of all, all praise to ALLAH for giving me the blessing, the strength, the chance and endurance to complete this thesis.

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I hope this study could be helpful for the practice and for knowledge seekers.

Abstract

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones and it is considered as one of the most common endocrinological disorders in the world. The aim of this study is to assess the risk factors for hypothyroidism among people attending the Governmental hospitals in Gaza Strip. Case control study was carried out in four governmental hospitals namely European Gaza hospital, Naser hospital, Shohda Al-aqsa hospital and Al-shifa hospital in Gaza strip. The sample was selected by convenient sampling method with total sample size of 300 (150 cases and 150 controls). The cases were adult clients already diagnosed with hypothyroidism who attended the selected governmental hospitals and the controls were adults without hypothyroidism from people who attended the Governmental hospitals. The matching was done in term of the same Governorate. Pilot study was carried out and resulted with no any modification in the instrument. P-value ≤ 0.05 and/or confidence interval of 95% are considered statistically significant. Bivariate analysis showed that there were statistically significant association (p < 0.05) between hypothyroidism and the under mentioned risk factors; the Socio-demographic factors including age (t: 3.625, p: 0.000), being female OR: 3.18 (1.63 – 6.17), educational level (p< 0.05 for all categories less than diploma), unemployment OR:2 (1.25 – 3.18), family history of thyroid diseases OR: 6.658 (3.38 – 13.10), present medical history of hypertension OR: 1.98 (1.16 – 3.39), present medical history of diabetes mellitus OR: 2.74 (1.39 – 5.36), presence of goiter OR: 29 (11.24 – 74.77), among reproductive factors postpartum thyroiditis (F: 25.34, p: 0.000), for drugs antiacid intake (t: 2.153, p: 0.043), iron intake (t: 2.19, p: 0.033),and for Dietary factors eating red meat 3 times and more weekly OR: 0.184 (.065 – 0.517) and eating red meat 1-2 times weekly OR: 0.247 (0.099 – 0.616), taking milk 3 times and more weekly OR: 0.395 (0.231 – 0.677) and taking milk less than once weekly OR: 0.38 (0.194 – 0.764), eating peanuts 1-2 times weekly OR: 0.472, (0.232 – 0.862) and eating peanuts Less than once weekly OR: 0.472 (0.272 – 0.819), eating pineapple (F:11.30, P:0.008), eating raisin 1-2 times weekly OR: 0.23 (0.085 – 0.645) and eating raisin less than once weekly OR: 0.447 (0.273 – 0.734), eating sesame less than once weekly OR: 0.468 (0.275 – 0.799) and eating walnuts 3 or more weekly, 1-2 times weekly and less than once weekly (OR: 0.294, 0.199 and 0.498 respectively, C.I: 0.097 – 0.892, 0.062 – 0.642 and 0.305 – 0.811 respectively). The study recommended that well adopted surveillance system for hypothyroidism and screening program for population at risk for hypothyroidism should be taken in place specially among female diabetic and/or hypertensive patients aged 40 years and above. In addition health education program should be adopted to increase awareness on hypothyroidism as one of the common endocrine disorders and to work on modifiable risk factors for hypothyroidism like drugs intake.

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List of Abbreviations

AITD	Auto immune thyroid disease
Anti-Tg	Thyroglobulin antibodies
Anti-TPO	Thyroid Peroxidase antibodies
EMRO	Eastern Mediterranean Region Office WHO
FT3	Free T3
FT4	Free T4
GD	Grave's Disease
LT4	Levothyroxine
MOH	Ministry of Health
NGO	Non-Governmental Organization
OCHA	United Nation Office for the Coordination of Humanitarian Affairs
PASSIA	Palestinian Academic Society for the Study of International Affairs
PCBS	Palestinian Central Bureau of Statistics
RAI	Radioactive iodine
SCH	Subclinical hypothyroidism
TBG	Thyroxin-binding globulin
Tg	Thyroglobulin
TPO	Thyroid peroxidase
TRH	Thyrotropin-releasing hormone
TSH	Thyroid stimulating hormone, thyrotropin
UI	Urinary iodine
UNFPA	United Nations Population Fund
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WHO	World Health Organization

Chapter One

1.1 Background

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones which, in turn, results in a generalized slowing down of metabolic processes. It is a common metabolic disorder in general population (khan & Majumder, 2010). In its clinically overt form, hypothyroidism is a relatively common condition, with an approximate prevalence worldwide of 2% in adult women and 0.2% in adult men. (Bello and Bakari, 2012). The prevalence is higher in surveys of the elderly in the community. Studies in Northern Europe, Japan and the USA have found the prevalence in a range between 0.6 and 12 per 1000 women and between 1.3 and 4.0 per 1000 in men investigated. A lower prevalence is seen in areas of iodine sufficiency (Vanderpump, 2011).

Hypothyroidism can be classified into three major categories: primary, secondary and tertiary. Primary hypothyroidism is an insufficiency of thyroid hormone specifically as a result of dysfunction of the thyroid which represent 99% of the cases of hypothyroidism (Banday et al., 2014). Secondary and tertiary hypothyroidism are caused by pathologies associated with pituitary gland and hypothalamus dysfunction, respectively (Gurevitz et al., 2011).

Iodine remains the most common cause of hypothyroidism worldwide. Almost one-third of the world's population lives in the area of iodine deficiency (Zimmermann, 2009). In area of iodine sufficiency, autoimmune disease (Hashimoto's thyroiditis) and iatrogenic causes are the most common causes of hypothyroidism (Khan and Majumder, 2010). Many factors had been discussed as risk factors of hypothyroidism. These may include age, gender (Roberts & Ladenson, 2004; Gesing et al., 2012), family history of thyroid disease (Strieder et al., 2003), history of other autoimmune diseases (Khatiwada et al., 2015), subclinical hypothyroidism (Khandelwal and Tandon, 2012), and diabetes mellitus (Al-Sumry et al., 2015). In addition, nutritional factors and environmental factors were also assumed as risk factors of hypothyroidism (Harris, 2014; Bajaj and Poonam, 2016).

Symptoms commonly associated with hypothyroidism may include constipation, cold intolerance, dry skin, proximal muscle weakness, and hair thinning or loss (Gaitonde et al., 2012). Hypothyroidism is diagnosed biochemically with TSH concentration being above reference range and low free T4 (Chakera et al., 2011). The mainstay of treatment for hypothyroidism is synthetic levothyroxine sodium (Chakera et al., 2011).

The researcher hope by conducting this study to highlight the possible risk factors of hypothyroidism among the Palestinian in Gaza strip. This may help to open the gate for other researches to deal with this issue in more details and specification to disclose the problem of hypothyroidism in Gaza, and participate in improving knowledge about this health problem to help decision makers to take necessary action targeting the improvement of health status of Palestinian people in Gaza strip.

1.2 Research problem

Hypothyroidism is being one of the most common endocrinological disorders in the world. In the communities with iodine sufficiency, the prevalence of hypothyroidism is between 1 % and 2 % its prevalence increase with age and in female sex. Studies in the United States, Europe, and Japan have reported the prevalence of hypothyroidism to be between 0.6 and 12 per 1000 in women and between 1.3 and 4.0 per 1000 in men (Almandoz and Gharib, 2012). In Colorado cross sectional study the prevalence of elevated TSH was 9.5% (Canaris et al., 2000).

Hypothyroidism can have many complications affecting cognitive functions and cardiovascular system. Severe untreated hypothyroidism can lead to heart failure, psychosis and coma (Chaker et al., 2017). In addition to its negative effect on quality of life, patients with hypothyroidism generally experience greater reductions in physical dimensions compared to social and emotional dimensions (Shivaprasad et al., 2018).

In Gaza strip where there are scarcity of resources, it is crucial to identify the leading risk factors for hypothyroidism in order to take preventive measures. Limited information available about the risk factors of hypothyroidism in Gaza strip. To the best of our knowledge this study is considered the first study in Gaza to handle the topic of risk factors of hypothyroidism and it will serve as a baseline study that generates an important information which will help the researchers and knowledge seekers in this issue. In other word, this study will fill important information gap regarding hypothyroidism.

1.3 Justification

To the knowledge of the researcher a few studies dealt with hypothyroidism in Gaza strip, so this study could be considered a baseline study in Gaza Strip to explore the risk factors of hypothyroidism in Gaza strip. By conducting this study we can generate information in order to improve the knowledge about hypothyroidism and its risk factors in Palestine and to give evidence to improve decision making processes at different levels of health care system. Moreover, by conducting this study the practitioners will be able to predict and control risk factors of hypothyroidism and so control its prevalence in a better way.

1.4 Study objectives

1.4.1 General objective

To determine the risk factors of hypothyroidism among people attending the Governmental hospitals in Gaza Strip.

1.4.2 Specific objective

1. To assess the relationship between socio-demographic factors and hypothyroidism
2. To study the relationship between chronic medical diseases and hypothyroidism .
3. To study the relationship between diet and hypothyroidism.
4. To explore the relationship between family history related factors and hypothyroidism.
5. To formulate recommendations to control modifiable risk factors of hypothyroidism and suggest possible and feasible screening activity.

1.5 Research questions

1. Is there association between socio-demographic factors and hypothyroidism?
2. Is there association between smoking and hypothyroidism؟
3. Is there association between diabetes mellitus and hypothyroidism?
4. Is there association between hypertension and hypothyroidism ؟
5. Is there relationship between autoimmune diseases and hypothyroidism؟
6. Is there relationship between family history of thyroid disease and hypothyroidism?
7. Is there association between diet and hypothyroidism?
8. Does number of parities in female increase the risk of hypothyroidism?
9. What are the applicable recommendations?

1.6 Context of the study

1.6.1 Socio-demographic context

Historical Palestine have an area of 27.000 km. and bordered by four countries Jordan, Egypt, Lebanon and Syria. In addition to the Mediterranean Sea, Aqaba Gulf and the Dead Sea. The Gaza Strip is lying on the Mediterranean Sea as a narrow piece of land; it is 45 kilometers long and 6-12 kilometers wide with an area of 378 square kilometers (PASSIA, 2008).

Gaza Strip suffered from many recurrent occupations. After the end of the First World War, historical Palestine was placed under the British Mandate. Then the period from 1948 to 1967, the Gaza Strip was under the Egyptian Administration. In June 1967 it was occupied by the Israeli army. In 1994 the Israelis officially handled the Gaza Strip to the Palestinian Authority according to Oslo agreement with partial autonomy that lead to improvement of the social and economic status of the people in Gaza till the setting up of Intifada in 2000 where the political and socioeconomic situation started to deteriorate. In June 2007 the life in Gaza reached to the catastrophic situation where a terrible event occurred “the internal division” and Gazan people started to suffer from its sequences. A tight siege has been imposed on the Gaza Strip to control borders, movement of goods and travelers. During that Israel launched three wars on the Gaza Strip which resulted in thousands of deaths and injuries among people and damage of thousands of houses, manufacture compounds and agricultural resources (MOH, 2013).

The total population of Gaza Strip and West Bank was about 4.81 million; 2,36 million females and 2.45 males (PCBS, 2017). The total number of the Palestinian population residing in the Gaza Strip is around 1.88 million (North Gaza Governorate-377126, Gaza Govrnorate-645204, Dier Al-Balah Governorate-273810, Khanyounis Governorate-351934 and Rafah Governorate-233490). The Gaza Strip is considered the highest density population area in the world. The population density in the Gaza Strip is more than 5154 inhabitants per one square kilometer according to the PCBS (2017). The majority of the Gaza Strip population is refugees (67.7%) who receive basic primary health care services and some secondary care services through UNRWA. The average family size is 5.7, nuclear household is 84.7% and extended household is 12.4% (PCBS, 2017). Among refugees, children below 18 years represents 42%, people 40 years and above constitutes 23.1%, women of reproductive age are 24.4% and male/female ratio is 1.02 (UNRWA, 2017).

The average life expectancy of the population in Gaza Strip is 74.6 for females and 71.5 for males (PCBS, 2017). The percentage of individuals aged 0-14 constituted 43.0% of the total population at mid-2015. The elderly population aged 65 years and over constituted 2.4% at the same period of time (PCBS, 2017). The growth rate in Gaza Strip during 2015 was 3.3% fertility rate was 4.5 and family size 5.7 (PCBS, 2017).

The economic status in the Gaza Strip has been deteriorated since 2006 as a result of a combination of siege, unemployment, restrictions on workers and industries which cause decline in living conditions and poor infrastructure. Moreover, the basic services quality was affected such as health, education, shelter and water. Also 54% of the Gaza Strip population are food insecure (OCHA, 2012). The PCBS (2016) declared that the main sources of livelihood in the Gaza Strip are employment at the services sector (mainly at government, UNRWA and NGOs), agriculture, fishing and livestock rearing. During 2015 the Gross Domestic Product (GDP) was 1.7 USD Billion, GDP Per Capita 971.1 USD and unemployment was 43.9% (PCBS, 2015). Most of people in Gaza strip depends on humanitarian aids provided by different relief agencies such as the World Food Program and UNRWA.

1.6.2 Palestinian health care system

In Palestine, the health care system is complex and very unique as operating under a very difficult and the hardest circumstances like political instability, economic constrains, Israeli occupation and internal separation. The health care system in Gaza strip is a part of and controlled by Ministry of Health of Palestinian National Authority. The health care system in Gaza strip is consisted of many health components such as primary, secondary, tertiary health care systems and other activities like communicable & non-communicable diseases, maternal, child, mental health, school health, environmental health, laboratory services, central pharmacy, physiotherapy and rehabilitation, treatment abroad, health insurance and other components. The MOH is the main heath care provider in Gaza strip. It has the responsibility for ensuring equitable and affordable access to quality health services for all Palestinians and provides primary, secondary, and tertiary services and purchase advanced medical services through referring patients to the neighboring countries and other private and NGOs health care facilities. The MOH also plays a role in providing and controlling immunization scheme, public health activities, licensing and registration of health facilities, but on the other hand other health players and contributors are existed such as Private Sector, NGOs, Military Medical Services and UNRWA (MOH, 2011).

Primary health care system

The primary health care provides a range of different services like maternal, child, non-communicable diseases, dental, school health and other services to the Palestinian people in Gaza strip. The majority of patients who are diagnosed with hypothyroidism can attend primary health care clinics to collect their medications and for follow up visits. In Gaza Strip, according to available services and facilities the primary health care centers are classified into four levels. The number of primary health care centers in Palestine reached to 739 in 2016, the majority of them about 587 are in West Bank and 152 in Gaza Strip. Around 466 primary health care centers managed by the Palestinian MOH (63.1% of the total number of primary health care centers). The number of primary healthcare centers belong to NGOs reached 189 (25.6% of all Primary health care facilitates), 64 primary health care centers operated by UNRWA (22 of them in Gaza Governorates) and the Military Medical Centers reached to 20 centers. Population rate per health center was 12,376 people. In the Gaza Strip, child health care is mainly provided by a wide network of primary health care centers managed by MOH (54 clinics), UNRWA (22), NGOs (20) and private providers (MOH, 2013). UNRWA is the second primary health care provider in Gaza Strip that plays an important role in health services delivery, providing free of charge primary health care (PHC) and purchasing secondary and tertiary services for the registered Palestinian refugees through 22 PHC centers (UNRWA, 2017).

Secondary and tertiary health care system

The total number of hospitals in Palestine is 80 hospitals (26-Governmental and 54-Non-Goevernmental); 30 of them in Gaza strip with capacity of 2399 beds count 37% of total hospitals in Palestine with rate of 1.4 beds per 1000 population per bed in Gaza Strip and 1.3 in West Bank. The grand total occupancy rate for Governmental hospitals is 86.8% . The mean of duration is 3 days. The total number of doctors, nurses, pharmacists and dentists were 3985, 7544, 273 and 1134 respectively during 2015 (PCBS, 2017).

The MOH allocated 849 beds of its hospital beds to medical cases (25.5% of the total beds of hospitals of the MOH), of which 382 are in Gaza Strip and 467 beds in West

Bank, while 907 beds were allocated to general surgery departments and sub-specialties (27.3% of the total number of hospitals in MOH), of which 445 beds in Gaza Strip and 462 beds in West Bank (MOH, 2013). Around 16 hospitals and centers provide obstetric services; 4 of them are Governmental hospitals. Bed occupancy rate at obstetric departments has reached to more than 100% in the past years (MOH, 2013). Obstetric beds per 10,000 ratio is only 2.1. In some NGO hospitals; the occupancy rate of the delivery bed is less than 30% (UNFPA, 2011).

Hospital based child health services (for under 12 years) are provided by three hospitals specifically for pediatrics in addition to 11 hospitals providing child health services within its services. The ratio of beds to child population is 8.5 beds per 10,000 (MOH, 2013).

In Gaza Strip, MOH operates and manages thirty hospitals, in this study, the researcher will focus on four hospitals. These hospitals are:

Shifa hospital: It is a central and major medical complex, established on 1946 and serves people of Gaza Governorate. It contains three hospitals, surgical, internal medicine and gynecology & obstetrics in addition to other services. The total number of beds is 439 and the total number of admissions is 160,550 (surgical-16052, internal-10063, obstetrics-67624 and intensive care unit-755). The total number of employees is 1785, doctors (574), nurses (695), pharmacists (32), paramedics (125) and managers and other employees (332), annual outpatients consultations are 78067 and emergency consultations are 264595. The number of surgical operations is 107260 (MOH, 2018).

European Gaza Hospital: It was established on 2000 and serves east region of Khanyounis Governorate and North region of Rafah Governorate. It provides surgical, internal medicine, pediatric services and is distinguished by cardiac catheterization service with total beds of 248. The total number of admissions is 20014 (surgical-7768, internal-6835, pediatrics-4230 and intensive care unit-1181). The total number of employees is 284 which includes doctors (164), nurses (307), pharmacists (23), paramedics (105) and managers and other employees (201). Outpatients consultations are 88018 (surgical-49840, internal medicine-28647 and pediatrics-9531)(MOH, 2018).

Naser Medical Complex: It was established on 1956 and serves West region of Khanyounis Governorate and consists of three hospitals, internal medicine, surgical and obstetrical hospitals. The total number of beds is 269. The total number of admissions was 38074 (surgical-6558, internal-6992, pediatrics-7983, obstetrics-14332and intensive care unit-2209). The total number of employees is 964, Doctors (249), nurses (387), pharmacists (34), paramedics (79) and managers and other employees (215), Annual outpatients consultations is 78067 and emergency consultations are 220821. The number of surgical operations is 3914 (MOH, 2018).

Shohda Al-Aqssa hospital: It is a general hospital, established on 2001and serves population of Dier Al-Balah Governorate. It provides internal medicine, surgical, obstetrical and pediatrics services. The total beds are 160. The total number of admissions is 24412 (surgical-3769, internal-3008, pediatrics-5645, obstetrics-9847 and intensive care unit-2116). The total number of employees is 583, doctors (149), nurses (228), pharmacists (14), paramedics (69) and managers and other employees (123). Outpatients consultations are 40380 and emergency consultations are 154501. The number of surgical operations is 4717 (MOH, 2018).

In Gaza Strip, the continuous Israel siege and the internal political division are strongly affecting the provision of health care services. The primary and secondary health sector faces many challenges as shortage of essential drugs and disposables at MOH facilities. About 38% of essential drugs were out of stock at central store level. This puts the patients at long standing risk of medical complications and deterioration in health status especially for cancer patients who are requiring on-going chemotherapy, patients with kidney diseases, transplants, hypertension, blood diseases and chronic illnesses in addition to other serious conditions who require a regular regime of medications (EMRO, 2012). In spite of these challenges, it is worth to mention that the health sector has exerted significant efforts not only to maintain health services but also to improve and develop some new services such as opening of new specialized services at MOH hospitals as cardiac surgery and cardiac catheterization (MOH, 2011).

1.6.3 Non-communicable diseases

Palestine is experiencing a rapid epidemiological transition, with increasing burden of chronic diseases. Nowadays, Palestinian population has a remarkable changes in lifestyle, nutritional behavior and environmental conditions. Such changes contribute to a substantial proportion of total mortality among Palestinian population. For instance, cerebrovascular diseases and diabetes are highly prevalent in the Palestinian society (Mosleh et al., 2016).

The number of patients with non-communicable diseases (NCDs) is increasing consistently by approximately 5.0% per year (UNRWA, 2014). The percentage of male patients diagnosed with NCDs has been increasing steadily (UNRWA, 2014). Cardiovascular diseases and diabetes shows high prevalence in the Palestinian society (Abdeen, 2006). In Gaza Strip the prevalence of diabetes mellitus among refugees of 40 years old and more was 13.1% and the prevalence of hypertension was 20.3 % during 2017 (UNRWA, 2018).

As the Palestinian community is in the health transition, chronic diseases contribute to an increased proportion of total deaths in the population (Abdeen, 2006). Non-communicable diseases form 70 % of the total causes of deaths in Palestine and includes cardiovascular diseases (CVDs), cancer deaths, cerebrovascular diseases, diabetes mellitus, respiratory system diseases (MOH, 2014). However in Gaza strip no data are available about the burden of hypothyroidism and it was not mentioned neither in the annual report of the MOH nor in the annual report of UNRWA.

1.7 Operational definition

1.7.1. Hypothyroidism

Hypothyroidism is an underactive thyroid gland. Hypothyroidism means that the thyroid gland can’t make enough thyroid hormones to keep the body running normally. People are hypothyroid if they have too little thyroid hormone in the blood. Common causes includes autoimmune diseases, surgical removal of the thyroid gland, and radiation treatment (American Thyroid Association, 2015).

Subclinical hypothyroidism is characterized by a serum thyroid stimulating hormone (TSH) above the upper reference limit in combination with a normal free thyroxin (T4) and there is no recent or ongoing severe illness (Garber et al., 2012).

1.7.2 Iatrogenic hypothyroidism

Inadequate secretion of thyroid hormone by the thyroid gland due to treatments that include medications (such asamiodarone), radioactive iodine ablation of the gland or surgi cal excision of the thyroid (Medical Dictionary, 2009).

1.7.3 Risk factor

Any characteristic of a person (such as age), a situation (such as the severity of a traumatic event), or a person's environment (such as family life) that increases the likelihood that person will eventually develop a disorder (Matthew, 2008).

Chapter Two

Conceptual framework and literature review

2.1 Conceptual framework

The conceptual framework was drawn by the researcher based on literature and personal experience. The framework demonstrates what the researcher is going to study. It connects and clarifies the relationship between the dependent and independent variables. The framework illustrates the various factors involved as risk factors for hypothyroidism.

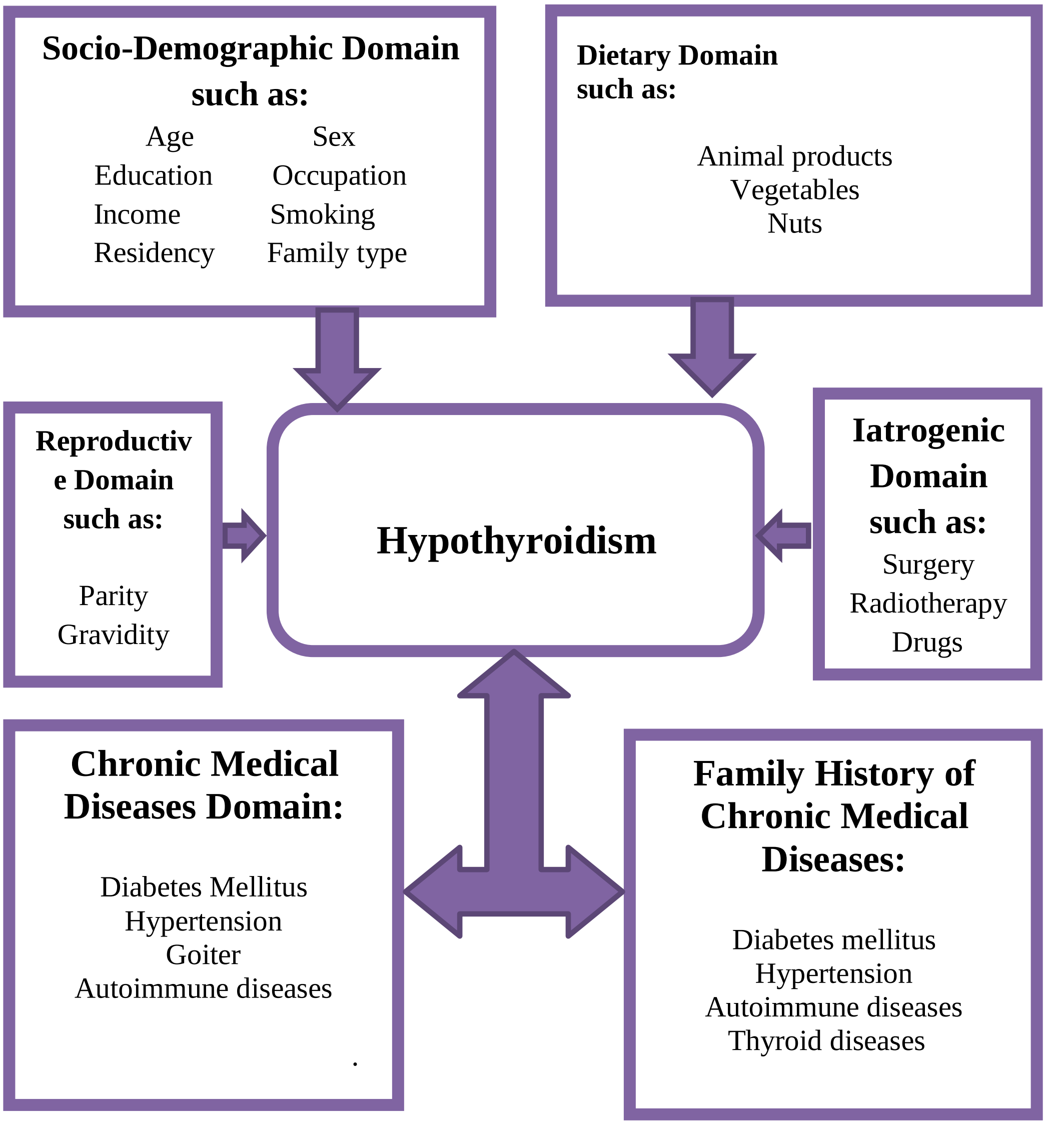


Figure 2.1 Conceptual frame work

In this study the dependent variable is hypothyroidism. The independent variables are categorized in 6 domains as following:

2.1.1: Socio-demographic domain

This domain includes age , sex , education, occupation, income, smoking, residency and family type either nuclear or extended family.

2.1.2 Chronic medical diseases domain

This domain includes diseases that might have relation with hypothyroidism like diabetes mellitus, hypertension, goiter and autoimmune diseases like rheumatoid arthritis, systemic lupus erthrymtosis, celiac disease and psoriasis.

2.1.3 Family history of chronic medical diseases domain

This domain deals with family history of chronic diseases like diabetes and hypertension as well as autoimmune disease like rheumatoid arthritis, systemic lupus erthrymtosis, celiac disease and psoriasis among the first degree relatives in addition to thyroid diseases.

2.1.4 Dietary domain

The dietary domain includes the frequency of intake of some animal products, some vegetables and nuts that may have a relation to thyroid function according to literature.

2.1.5 Iatrogenic domain

It includes the surgical interventions related to thyroid, exposure to radiation and intake of drugs that might have relation with hypothyroidism like lithium, amiodarone and methimazole.

2.1.6 Reproductive domain

This domain is special for female as it deals with gravidity, parity and infertility in addition to the onset of hypothyroidism within one year after delivery.

2.2. Literature review

2.2.1 Definition of hypothyroidism

Hypothyroidism is a common condition of thyroid hormone deficiency which is readily diagnosed and managed, but if untreated it could be potentially fatal in severe cases. The hypothyroidism definition is made on basis of reference ranges of the relevant biochemical tests (Chaker et al., 2017). In this context, Park et al. (2013) and Granfors (2015) defined hypothyroidism as TSH level above the defined upper limit of the reference range in combination with a serum free T4 below the lower limit of the reference range.

Hypothyroidism is defined as inability of the thyroid gland to secrete the needed amount of thyroid hormone required for different metabolic activities of the body (Gaitonde et al., 2012). In addition Khan and Majumder (2010) defined hypothyroidism as clinical syndrome which is characterized with generalized slowing down of metabolic processes as a consequence of the thyroid hormones deficiency.

American thyroid association (2015) described hypothyroidism as an underactive thyroid gland. Hypothyroidism could be defined as a state in which thyroid gland is unable to produce sufficient amount of thyroid hormone required for normal functioning of the body. People are hypothyroid if they have low level of thyroid hormone in their blood. Yet the definition of normal thyroid function has not been universally standardized. However, different assays of the thyroid function indicated that the upper limit of TSH normal level is 4.5 μIU/L is (Surks et al., 2004).

2.2.2 Classification of hypothyroidism

Hypothyroidism can be classified into three major categories: primary, secondary and tertiary. Primary hypothyroidism is an insufficiency of thyroid hormone specifically as a result of dysfunction of the thyroid gland. Secondary hypothyroidism is caused by pathologies of pituitary gland while tertiary hypothyroidism is caused by pathologies related to hypothalamus dysfunction (Gurevitz et al., 2011). In approximately 99% of the cases of hypothyroidism, primary hypothyroidism is the etiology, while secondary hypothyroidism represents less than 1% of the cases of hypothyroidism (Banday et al., 2014).

In addition hypothyroidism can be classified by Biochemical and clinical criteria into subclinical hypothyroidism and clinical (overt) hypothyroidism. Subclinical hypothyroidism is characterized by a elevated level of TSH above the upper limit of the reference range in combination with a normal free thyroxin (T4). This nomenclature is applicable when the stability of thyroid function has been observed for weeks or more, the hypothalamic-pituitary-thyroid axis is normal, and there is no sever disease going on. While combination of low level of free T4 with elevated TSH level above 10 mIU/L, establishes the case of overt hypothyroidism (Garber et al., 2012).

2.2.3 Prevalence (Magnitude) of hypothyroidism

A meta-analysis study conducted in Europe concluded that thyroid dysfunction is one of the main endocrine disorders and around 30% to 40% of patients that used to be managed in an endocrine practice are cases of thyroid gland dysfunction, while prevalence of undiagnosed hypothyroidism in 7 studies was found 4.9% and in another 9 studies the prevalence of diagnosed and undiagnosed hypothyroidism was 3.1%, but the incidence rate was 226.2 per 100 000 per year (Madariaga et al., 2014).

A review study conducted in Bangladesh revealed that hypothyroidism is one of the main metabolic disorders in the general population with a prevalence of primary hypothyroidism of 1% that may reach up to 5% if cases of subclinical hypothyroidism are included (Khan and Majumder, 2010). Meanwhile, Gurevitz et al. (2011) found that primary hypothyroidism is a common disorder affecting 1-10% of the population of the United States of America. Gaitonde et al. (2012) estimated that almost 13 million Americans have undiscovered hypothyroidism. Vanderpump (2011) in a follow up survey for 20 years in the United Kingdom found that hypothyroidism has annual incidence of 3.5 per 1000 in women, while in men the incidence was 0.6 per 1000. In Australia, it was shown in a cross sectional study that overt hypothyroidism has a prevalence of 5.4 per 1000 (So et al., 2012). While in Norway a survey study conducted among 94009 showed that females had hypothyroidism prevalence of 4.8% and males had a prevalence of 0.9% (Bjoro et al., 2000).

In India, overt hypothyroidism has a prevalence of 3.9% and a high prevalence of subclinical hypothyroidism was also recorded with a value of 9.4% in general population but in respect to gender the prevalence was 11.4% and 6.2% for women and men, respectively (Unnikrishnan and Menon, 2011). In another study conducted also in India, Bagcchi (2013) found a high prevalence of hypothyroidism, which affects 10% of general population as compared to the prevalence in the United Kingdom and the prevalence in United States that is less than 2% and less than 5% respectively. Kutluturk et al. (2013) showed that overt hypothyroidism had a prevalence of 1.6% of and subclinical hypothyroidism had a prevalence of 2.7% among the general population.

In Arab world the prevalence of hypothyroidism varies between countries, for example in Libya overt hypothyroidism was reported at prevalence of 1.1% (Nouh et al., 2008), while another study performed by Ghawil et al. (2011) in Libya showed a prevalence of subclinical hypothyroidism as 2.3%. A third study showed a prevalence of hypothyroidism of 6.2% in Libya (Nouh et al., 2008). In Saudi Arabia, the prevalence at Makkah region of hypothyroidism showed a very high level with rate of 47.3% (Lamfon, 2008). In addition, a study conducted in West Bank (Hebron), with a sample of 540 participants showed that the prevalence of hypothyroidism was 5.2% (Amro et al., 2017). However, there is no data available about the prevalence of hypothyroidism in Gaza strip.

2.2.4 Etiology of hypothyroidism

The most common cause of hypothyroidism worldwide remains Iodine deficiency. Being a scant component of soil, in most of the world, iodine is found in little amounts in the food (Khan and Majumder, 2010). Zimmermann (2009) stated that near one-third of the world's people lives in the areas of iodine deficiency. While in areas with sufficient amount of iodine, the most common causes of hypothyroidism are autoimmune disease and iatrogenic causes (Khan and Majumder, 2010). Vaidya and Pearce (2008) described autoimmune thyroiditis as the main cause of hypothyroidism in the developed countries, that could either be associated with a goiter (Hashimoto's thyroiditis) or, thyroid atrophy.

Twin studies suggested that genetic factors and environmental factors contribute to the risk of contracting auto immune thyroid disease by about 70% and 30% respectively (Gurevitz et al, 2011). Among the environmental factors are high intake of iodine, intake of insufficient amount of selenium, tobacco smoke, some infectious diseases such as chronic hepatitis C, and certain drugs that had been associated with development of autoimmune thyroiditis (Akamizu et al., 2012).

Near to one third of patients with recent diagnoses of overt hypothyroidism have received destructive therapy for hyperthyroidism (Vanderpump and Tunbridge, 2002).

Some people with thyroid cancer, Graves' disease, or nodular goiter are treated with radioactive iodine (RAI) in order to destroy their thyroid gland (Almandoz and Gharib, 2012). Radiotherapy used for treatment of Hodgkin's disease, lymphoma, or cancers of the head or neck is also implicated in the development of thyroid dysfunction. Radiotherapy for head and neck cancer resulted in hypothyroidism in 10-45 % of the cases exposed to this modality of treatment (Fujiwara et al, 2015).

Drugs such as lithium, amiodarone, interferon alpha and interleukin-2 can hinder thyroid gland ability to manufacture or excrete the thyroid hormone. Such drugs are more likely to induce hypothyroidism in patients who have a genetic factors predisposing to autoimmune disease of thyroid (Almandoz and Gharib, 2012).

2.2.5 Socio-demographic risk factors for hypothyroidism

Age and sex

Age is one of the most significant risk factors for hypothyroidism. Hypothyroidism is more prevalent in people with age over 60 years (Gurevitz et al, 2011). The thyroid dysfunction increases with age, and women are more prone to that (Khan and Majumder, 2010). Age-related hypothyroidism might be explained by a normal physiologic process of aging, decrease in the thyroid gland ability in responding to TSH, or the increase of thyroid autoantibodies (Park and Kim, 2014). In the same line, a 20-years follow-up Whickham survey showed that the incidence of positive antithyroid antibodies and hypothyroidism increases as the age increases (Vanderpump et al. , 1995).

A study conducted in India involved 1500 newly diagnosed cases of hypothyroidism form 33 medical centers showed that the patients had a mean age of the 41.1 ± 14.01 years, and a ratio of 7:3 was shown between female and male (Sethi et al., 2017). However, a descriptive study was conducted in some teaching hospitals in Baghdad with random sample of 50 patients, revealed that the 96% of the study sample for hypothyroidism were females, and 32% were 28-37 years old (Hassen and Ahmed, 2016).

Women are 5-8 times more likely to develop hypothyroidism than men (Gurevitz et al, 2011). In the Framingham study, Sawin et al. (1985) showed that TSH values over 10 mIU/L is seen in 5.9% of women and 2.3% of men who exceeded the age of 60 years. Moreover, the risk to develop hypothyroidism was higher in women who has two risk factors of positive antibodies and elevated TSH as compared to those with one risk factor 4% and 2% respectively (Vanderpump and Tunbridge, 2002).

In Scotland, a study conducted in Tayside with 390000 participants between 1994 and 2001 revealed an increase in the prevalence of hypothyroidism among females from 3.2% to 5.5% while among males the increase in prevalence was from 0.5% to 1.0% (Endocrine Society, 2015). In addition, a study conducted in eight Indian cities showed a significant association between female gender and older age on one hand and hypothyroidism on the other hand (Unnikrishnan et al., 2013).

Smoking

The relation between smoking and thyroid function is debatable, and the effect of smoking on thyroid hormone action is obscure (Müller et al., 1995). In majority literature showed an inverse relation between smoking and hypothyroidism.

In a case control study conducted in Denmark, Laurberg et al. (2013) showed that recent quitting of smoking was linked to increase in the incidence of hypothyroidism as compared to people who never smokes, those with less than 1 year after quitting smoking had odds ratio of 7.36 [2.27 to 23.9] as compared to non-smoker, for those who had quitted smoking for 1 to 2 years, odds ratio was 6.34 [2.59 to 15.3]; while for those who quitted smoking for 3 to 10 years, odds ratio decreased to 0.75 [0.30–1.87], results were harmonious in both sexes regardless of age. In the same line a case control study showed that smoking discontinuation was associated with an increased risk for occurrence of antithyroid antibodies. This observation favors the opinion that smokers have a decreased risk of hypothyroidism (Wiersinga, 2013).

In the prospective cohort study of Amsterdam, a nested case–control study was developed within it, with 790 healthy women who is not known to have any thyroid dysfunction and each woman has a history of autoimmune thyroid disease among her first or second degree relatives, these women were followed for 5 years, the incidence of hypothyroidism was less common among smokers as compared to non-smokers (P=0.083)(Effraimidis et al., 2011). However, one study by Duntas (2008) referred to tobacco smoking as risk factors for autoimmune thyroiditis, which made tobacco smoking possible risk factors for hypothyroidism.

Several studies showed that there is no relation between smoking and hypothyroidism (Pontikides and Krassas 2002; Walsh et al., 2010). In addition, a study conducted in Switzerland included 135 hypothyroid women showed that smokers and non-smokers cases among the women with overt hypothyroidism had a similar levels of the serum concentrations of TSH, free T4, and T3(Müller et al., 1995).

Occupation and exposure to chemicals

Among many chemical contaminants, halogenated organochlorines and pesticides can disturb the thyroid function and affect the hypothalamic-pituitary-thyroid axis in variable ways (Duntas and Stathatos, 2015). With regard to occupation little was found in literature. Cheserek et al. (2014) showed that a lower thyroid stimulating hormone was recorded among subclinical hypothyroid male workers engaged in academic work (5.12±0.52 mU/l) as compared to those engaged in administrative work (5.23±0.52 mU/l). In a retrospective study conducted in Korea with participation of 967 female workers at a university hospital, the night shift workers showed higher levels of thyroid stimulating hormone as compared to non-night shift workers (95 % CI: 0.087–0.519 mIU/L, $p = 0.006$). With adjustment for age and department, night shift workers exhibited a higher risk for subclinical hypothyroidism as compared to their non-night shift counterpart with odds ratio of 1.399 (95 % CI: 1.050–1.863, $p = 0.022$) (Moon et al, 2016). In addition, Chen et al. (2017) showed that doctors showed a significantly higher risk for thyroid dysfunctions as compared to their controls [odds ratio (OR): 1.27; 95% (CI): 1.10–1.47], hypothyroidism was the second among these diseases (OR: 1.64; 95% CI: 1.23–2.18).

Organochlorine pesticides induce hepatic enzymes leading to decreased half-life of serum thyroxin and so it had been proposed as risk factors for hypothyroidism (Bajaj and Poonam, 2016). In their study to demonstrate the relationship between pesticide use and thyroid diseases in females, Goldner et al. (2010) described an association between hypothyroidism and the use of organochlorine insecticides (OR=1.2, 95% CI= 1.0-16) and fungicides (OR=1.4, 95% CI= 1.1-1.8). In another study involved 679 male pesticide applicator, Lerro, et al. (2017) found that subclinical hypothyroidism was positively associated with higher exposure to the insecticide aldrin (OR=4.15, 95% CI 1.56 to 11.01, OR=4.76, 95% CI 1.53 to 14.82, P<0.01), with higher levels of thyroid stimulating hormone (P=0.01) and lower level of T4 (P=0.04) as compared to those of low exposure.

In addition, a case-control study conducted in Gaza strip to assess the relationship between pesticides and thyroid and gonadal hormones revealed that the mean level of serum TSH in pesticides-exposed farm workers (2.4±1.1) was significantly higher than that of controls (2.0±0.9) with p-value < 0.05 (Al-Shanti and Yassin, 2017).

2.2.6 Chronic medical diseases

In a study conducted in India by Sethi et al. (2017) and involved 1500 newly diagnosed cases of hypothyroidism form 33 medical centers, chronic disease were reported in 545 patients (36.4%). The most prevalent was Type 2 diabetes mellitus (13.5%) second to it was hypertension (11.3%).

Al-Sumry et al. (2015) showed that prevalence thyroid dysfunctions were higher among diabetic patients (12.6%) as compared to healthy non diabetic control group (4.9%). The commonest thyroid dysfunction among diabetics was overt hypothyroidism (4.6%). Khatiwada et al. (2015) showed prevalence rate of thyroid dysfunction of 36.0% in their cross-sectional study which involved 419 diabetic clients in Nepal, among these dysfunctions subclinical hypothyroidism was the most common (26.5%). In the same line a sample of 200 subjects enrolled in a case control study (100 cases of DM and 100 controls), showed that hypothyroidism was present in 22% of cases of these 8% had overt hypothyroidism and 14% had subclinical hypothyroidism, while all the controls exhibited normal thyroid hormone level, SO they came with a conclusion that there is high prevalence of hypothyroidism in type 2 diabetic patients as compared to healthy people (Makandar et al., 2015). In Saudi Arabia, a study among diabetic patients reported a high prevalence of thyroid dysfunction among type 2 diabetics reaching 28.5%, of which 25.3% had hypothyroidism (Al-Geffari et al, 2013). In addition, hypothyroidism was of higher prevalence among Egyptian women with type 2 diabetes mellitus as compared to control women (Elebrashy et al., 2016).

Association between overt hypothyroidism and diastolic hypertension was reported in many studies (Amouzegar et al, 2015). In a study carried out in Norway, which was a population-based health survey, measurement both of serum thyroid stimulating hormone and blood pressure were done, the study showed significant and positive relation between serum thyroid stimulating hormone and both systolic and diastolic blood pressure was reported (Iqbal et al., 2006). In their study, Asvold et al. (2007) indicated that for each unit increase in thyroid stimulating hormone concentration there is an increase of systolic blood pressure in both men and women. The same increase was reported in the diastolic blood pressure for each unit increase in thyroid stimulating hormone concentration. On other hand, a study conducted in Iran concluded that there was no significant association between the change in thyroid stimulating hormone levels and blood pressure profile (Amouzegar et al., 2015). However, the presence of other medical condition may increase the chance of association as shown in cross sectional study involved 517 hypertensive clients among them 373 were diagnosed as cases of obstructive sleep apnea (OSA), OSA hypertensive cases showed a significantly higher prevalence of subclinical hypothyroidism as compared to non-OSA ones (15.0% versus 6.9%,). In addition, the hypertensive cases with severe OSA had a serum level of thyroid stimulating hormone that is significantly higher than in those without OSA (0.99±0.81versus 0.74±0.77 μIU/mL, $P<0.05$) (Nanfang , et al., 2016).

Hypothyroidism is positively associated with history of autoimmune diseases such as rheumatoid arthritis, Sjögren's syndrome, pernicious anemia, type 1 diabetes, lupus or celiac disease (Akamizu et al., 2012). Another study described associations between hypothyroidism and other autoimmune diseases in 6.3% of patients of type I diabetes mellitus, vitiligo and adrenal insufficiency (So et al., 2012). In addition, Ventura et al. (2000) found that there is reduction in the titer of thyroid antibodies with consumption of gluten free diet for a period of six months.

Elattar et al. (2014) studied the relationship between rheumatoid arthritis and hypothyroidism in Egypt. The sample included 150 patients diagnosed as rheumatoid arthritis and 50 controls not known to have autoimmune disease, matching was done based on age and sex. Hypothyroidism was the most common disorder found in 36 (24%) patients versus one (2%) control participant and overt hypothyroidism was three times more common in RA female patients as compared to other healthy women. In this study, 31 (20%) female RA patients compared with five (4%) men had hypothyroidism. In another study included 100 systemic lupus erthyrimatosis (SLE) Egyptian patients and 100 matched controls, El-Hadidi et al. (2014) showed that the SLE patients had a higher prevalence of subclinical hypothyroidism as compared to control participant 10% ($p = 0.002$), clinical hypothyroidism as well was of higher prevalence among cases of SLE, as compared to control participant, reaching 4% ($p = 0.121$).

Hypothyroidism either clinical or subclinical has a higher prevalence among patients with chronic kidney disease as compared to healthy population. Primary hypothyroidism which is not autoimmune in origin has a greater prevalence among patients with advanced diabetic nephropathy in comparison with patients of nephropathy that is not diabetic in origin (Iglesias & Diez, 2009). Forty one adult diabetic kidney disease patients were enrolled in a prospective cohort study; they were screened for hypothyroidism, the results showed that hypothyroidism was a prevalent condition in diabetic kidney disease with 34.1% of patients being hypothyroid. Furthermore, the prevalence of hypothyroidism increases with declining renal function. Hypothyroid diabetic kidney disease patients were significantly younger in age as compared to euthyroid diabetic kidney disease patients (Bajaj et al, 2016-B).

Goiter of thyroid gland could be a risk factor for hypothyroidism. Di´ez & Iglesias (2004) conducted a prospective study which included 107 patients over age 55 years with no previous history of thyroid illness. Subjects were followed up for 6–72 months. Kaplan-Meier analysis showed that the presence of symptoms of hypothyroidism, goiter, positive antithyroid antibodies was significantly related to development of hypothyroidism in this prospective study ($P < 0.05$). In addition, some studies claimed associations between hypothyroidism and chromosomal disorders like Trisomy 21, Turner's syndrome and Klinefelter's syndrome (Wass & Stewart, 2011).

2.2.7 Family history of chronic medical diseases

Family history of autoimmune thyroid disease is a risk factor for development of hypothyroidism, whether in first degree or second degree relatives. A study conducted at Baghdad Teaching Hospital found that family history for hypothyroidism was present in 44% of the patients (Hassen and Ahmed, 2016). In another study of 803 subjects, 440 had family history of autoimmune thyroid disease among more than one patient in the family, these autoimmune thyroid diseases were Graves' disease and Hashimoto's thyroiditis in 33% of families. Although the participants were not known to have any thyroid related disease, hypothyroidism was confirmed in 3.6% of the participant, while 1.3% of these participants were cases of clinical hypothyroidism (Strieder et al, 2003). In addition, Aminorroaya et al. (2017) indicated that presence of family history of thyroid diseases is strongly associated with occurrence of clinical hypothyroidism (OR: 1.76; CI: 1.07-2.88). On the same line Leung. (2017) showed that first degree family members of patients with hypothyroidism are at increased risk of hypothyroidism by nine folds as compared to those who has no family history of hypothyroidism.

2.2.8 Dietary risk factors for hypothyroidism

Deficiencies of trace elements or micronutrients like iodine, iron, zinc and selenium were documented to impair thyroid function (Khatiwada, et al, 2016).The alterations in the dietary components may lead to thyroid dysfunction in predisposed individuals (Sharma et al., 2014). The iodine intake from dietary sources in a typical food basket can be variable from one country to other, from regions to region, or even within a region. This depends on multiple factors including salt fortification program, the content of iodine in food and food habits and cultures (Granfors, 2015). The areas with severe deficiency of iodine show a higher prevalence of hypothyroidism as compared to areas of optimum iodine intake. On the other hand, the areas of optimum or excessive iodine intake shows a higher prevalence of subclinical and overt hypothyroidism as compared to those areas of mild to moderate iodine deficiency (Zimmermann and Boelaert, 2015).). Autoimmune hypothyroidism is 1.5-2 more likely to develop in the people with sufficient iodine intake as compared to people having mild to moderate iodine deficiency (Laurberg et al., 2013).

The daily recommended iodine intake is 150 µg/day. It was estimated that average iodine intake in Palestine is 140 µg /day which is almost 93% of daily recommended intake (MOH, 2014). Salt iodization is an essential public nutrition programme in Palestine since 1996. Potassium iodate is added to table salt in order to supply iodine to the community for prevention of goiter (MOH, 2014). Excess iodine in the diet may lead to transient hypothyroidism, known as Wolff-Chaikoff's effect. The predisposing factors for iodine induced hypothyroidism are extremes of age, autoimmune thyroid disease and past history of treated Graves' disease (Sharma et al., 2014).

In Baghdad a descriptive study was conducted to assess dietary risk factors related to hypothyroidism for adult patients with random sample consisted of 50 patients, showed high effect of butter and pineapple on hypothyroidism, and moderate effect of red meat, Milk, spinach and green pepper (Hassen and Ahmed, 2016).

Iron deficiency was present in a significant portion of patients with primary hypothyroidism (Banda et al., 2014). Iron deficiency is accompanied by a decrease in serum T4 and T3 and increasing TSH concentration as compared to healthy subjects

(Bivolarski et al., 2013). In a study conducted in Iran, improvement in the thyroid function in clients with iron deficiency was reported after iron supplementation for 12 weeks (Eftekhari et al., 2007). In this regard, it has been hypothesized that thyroid disorders are negatively affected by iron deficiency (Khatiwada et al., 2016).

Vitamin D deficiency is highly prevalent with estimation that one billion people live with it in the world (Harris, 2014). Several studies linked vitamin D deficiency to hypothyroidism. Mackawy et al. (2013) showed that hypothyroid Saudi patients have significantly lower vitamin D as compared to controls (P =0.000). In his study on patients who attended a tertiary hospital for thyroid evaluation, Kim (2016) showed that autoimmune thryoid disease clients have a significantly higher prevalence of vitamin D insufficiency as compared to those without autoimmune thyroid disease (46.1% vs. 37.1%, p=0.011), it was also higher in Hashimoto thyroiditis patients than Grave's Disease patients (48.9% vs. 41.9%, 37.1%, p=0.017). Among Hashimoto thyroiditis cases, vitamin D insufficiency showed higher prevalence among cases of clinical hypothyroidism (p <0.001).

Many Studies indicated that vitamin D may play an important role in the immune system (Deluca and Cantorna, 2001). However, it’s unclear whether the low vitamin D levels were results of hypothyroidism or a direct cause of the disease (Harris, 2014). A meta-analysis study suggested that autoimmune thyroid disease is related to lower serum vitamin D, and its deficiency may play a role in the development of the autoimmune thyroid disease, which is a risk factor for hypothyroidism (Wang et al., 2015).

Selenium is a micronutrient founded in many proteins. In adults, the thyroid is one of the main store of selenium. Selenium levels in the body depend on the population’s diet, the geographical nature of the area, and soil composition (Ventura el al., 2017). Among main sources of selenium are meat, fish, egg, beans, and milk and its products (Waegeneers et al., 2013 and Butler, 2018). Selenium deficiency was found to decreases the synthesis of thyroid hormones and it has a protective action against autoimmune thyroiditis (Ventura el al., 2017).

Goitrogenic foods can hinder the thyroid function; by preventing the thyroid gland from utilizing the available iodine. They present in brussels sprouts, rutabaga, walnuts, turnips, cauliflower, peanuts, cabbage, and almonds (Thyroid UK, 2017). Cruciferous vegetables such as broccoli, cauliflower, and cabbage release a compound called goitrin that can interfere with the production of thyroid hormones. However, this is usually become remarkable if combined with an iodine deficiency (Harris, 2014). A population based descriptive study done in Sri Lanka shows that there is no association between goitrogenic food items and prevalence of goitre (Fernando, 2017). On the other hand, vegetarian diets were not associated with increased risk of hypothyroidism. The goitrogenic effect of a food depends upon the amount of active goitrogen present in it, which is usually affected by different food preparation methods like soaking, washing, boiling and cooking which could reduce the goitrogenic potency of foods. These methods in addition to the iodine supplementation are generally practiced in many areas making the precise effect of such methods vague (Bajaj et al., 2016-A).

2.2.9 Iatrogenic risk factors for hypothyroidism

In a meta analytic study it was shown that lithium therapy is associated with hypothyroidism and in many occasions with goiter as well with variable frequencies that ranges from 0% to 52% (Kibirige el al., 2013). Amiodarone is one of the most commonly used antiarrhythmic medication in the world can lead to both hypothyroidism and less commonly hyperthyroidism (Narayana et al, 2011). In addition, other drugs including carbimazole, propylthiouracil, iodine, thalidomide, sunitinib, and rifampicin have association with hypothyroidism (So et al., 2012). Hypothyroidism induced by medications often resolves with the discontinuation of the drug, while hypothyroidism associated with radiation is mostly irreversible (The American Thyroid Association, 2014).

In a prospective study to follow 82 cases post hemi-thyroidectomy to evaluate the occurrence of hypothyroidism, it was shown that 18% of cases developed hypothyroidism. There was no evidence on presence of relationship between age, sex or weight of resected tissue and the possibility of developing hypothyroidism (Wormald et al., 2008). A meta-analysis study exhibited that near to 20% of clients of hemi thyroidectomy will develop subclinical hypothyroidism, while clinical hypothyroidism occurs in one out of 25 cases of hemi thyroidectomy (Verloop et al., 2012). A study forms Suadia showed a high overall incidence of hypothyroidism following hemi thyroidectomy (45%). To ensure proper follow up and as most of the patients (70.3%) developed hypothyroidism within the first 6 months of post-surgery, Thyroid stimulating hormone should frequently be assessed in the first 6 months, this may help in initiating the treatment before the appearance of symptoms. On another way it may be advisable to measure thyroid stimulating hormone level 4 weeks and 3 months after surgery, thyroid stimulating hormone level should again be measured at 6 and 12 months, and every 6 thereafter (Lee and Chung, 2012). No specific risk factor was related to the development of hypothyroidism after surgeries of hemi thyroidectomy (Al-Shalhoub and Al-Dhahri, 2017). The period after hemi thyroidectomy lapsing till occurrence of hypothyroidism varies in literature. It ranges from 2 weeks after surgery to open range after that with expectation of yearly occurrence (Lee and Chung, 2012)

Metso (2007) evaluated the occurrence of hypothyroidism post radioactive iodine therapy for the cases of Grave's disease and toxic nodular goiter. The cumulative incidence of hypothyroidism was 24% in first year and 82% after 25 years for Grave's disease management and 4% in the first year and 32% at 25 years for toxic nodular goiter. Mumtaz et al. (2009) studied 260 patients who received radioactive therapy for Grave's disease. Sixty seven developed hypothyroidism within 12 months. The hypothyroidism was temporary in 58%. But in the subsequent 2 to 11 years 70% of these temporary hypothyroidism became permanent hypothyroidism. Female gender, surgeries of the thyroid gland and other surgeries of the neck were associated with higher risk of development of hypothyroidism after radiation therapy with odds ratio as following (OR 1.6; 95%([CI], 1.3-1.9; $P < .00001$), (OR 8.3; 95% CI, 5.7-12.0; $P < .00001$) and (OR 1.7; 95% CI, 1.16-2.42; $P<.006$) respectively (Vogelius et al, 2011).

Within one year of radioactive iodine therapy the incidence of hypothyroidism was 32.9%, with lesser chance of developing hypothyroidism among women post RAI therapy (odds ratio, 0.406; 95% CI: 0.181–0.908; $p = 0.028$). A dose-response relationship was shown in many studies, at a dose of 45 Gy there is 50% risk of developing hypothyroidism, but there is considerable variation in the dose response between studies. Chemotherapy and age were not associated with risk of hypothyroidism in this analysis (Vogelius et al., 2011). In addition, Fan et al. (2017) showed that there a significantly higher risk of developing hypothyroidism among Taiwan patients with nasopharyngeal carcinoma than in the matched control (adjusted Hazard Ratio = 14.35, 95% CI = 11.85–17.37) and the head and neck cancer cohort (adjusted Hazard Ratio = 2.06, 95% CI = 1.69–2.52). Younger age, higher urbanization level, female sex, receipt of chemotherapy and autoimmune disease are all Independent risk factors for hypothyroidism among nasopharyngeal carcinoma patients. Akyurek et al. (2014) evaluated the risk of hypothyroidism post radiotherapy management of breast cancer among Turkish women. The results showed that the median time to the development of hypothyroidism was 9 months (range: 3-18 months) with association with dose of radiotherapy.

In their study to explore the incidence of hypothyroidism among post radiotherapy treatment of 187 head - neck cancer patients followed for 2 years, Aich et al. (2005) found that 17.8 % and 21.8 % of the cases had clinical and sub-clinical hypothyroidism after follow up for two years.

Effraimidis et al. (2011) in their study to explore the relation between use of estrogen and the incidence of AITD revealed that the use of oral estrogens shows no difference between case and controls in the incidence of autoimmune thyroid diseases after following up euthyroid women for 5 years. However, in another study estrogen was documented as risk factor for hypothyroidism (Stegall et al., 2014).

2.2.10 Reproductive risk factors for hypothyroidism

The risk of developing hypothyroidism in women increases with age and during pregnancy, the postpartum period, and menopause (Garber et al., 2012). Hypothyroidism is one of the commonest endocrine disorders in women in the reproductive age. According to Uppsala university study in Sweden the prevalence of clinical hypothyroidism during pregnancy was estimated to be 0.3-0.5% (Granfors, 2015).

Postpartum thyroiditis (PPT) occurs in women after the delivery of a baby, in which thyrotoxicosis occurs first followed by hypothyroidism with recurrence in high percentage of patients after subsequent pregnancies (ATA, 2014). A female is considered at high risk for of hypothyroidism if she is a postpartum woman (Stegall et al., 2014). Many women develop permanent hypothyroidism sometime during the 3 to 10 year period after an episode of PPT (Hernández and Domínguez, 2013). PPT shows is variable prevalence in different countries it ranges from 1.1% in Thailand to 16.7% of in United Kingdom. The causes behind the variability of PPT prevalence could be attributed to many factors like genetic and environment ones and may be due to different or inappropriate screening procedures. Women with type I diabetes mellitus have three folds higher risk of developing post-partum thyroiditis as shown in three different studies, US women with type I diabetes mellitus had a 25% incidence of PPT. It was shown that women with history of post-partum thyroiditis had a 69% recurrence rate of the disease in the subsequent pregnancy (Roti and Uberti, 2002). According to ATA (2014) approximately 5-

10% of women in the United States develop postpartum thyroiditis. Many risk factors can increase the risk of postpartum thyroiditis in certain populations like history of thyroid dysfunction, autoimmune diseases, family history of thyroid disease or past history of PPT (ATA, 2014). In the prospective cohort of Amsterdam, a nested case–control study was developed within, with 790 healthy women who is not known to have any thyroid dysfunction but have at least a first or second degree relative with autoimmune thyroid disease were followed for 5 years. Postpartum period showed higher incidence of hypothyroid cases (P=0.006) as compared to their control (Effraimidis et al., 2011).

Being a pregnant woman is a risk factor for development of hypothyroidism; however, in a clinical trial, age of the pregnant woman did not increase the risk (Stegall et al., 2014). It was shown in a retrospective cohort study at the American University of Beirut Medical Center that 17% of 920 pregnant ladies were diagnosed as hypothyroidism. The history of previous miscarriage and morbid obesity were associated with hypothyroidism during pregnancy (Ezzeddine, et al., 2017). In a population based study in Danemark in which 77445 women studied for the onset of thyroid dysfunction, hypothyroidism was one of these disorders; the prevalence was traced before, during and in 5 years period after pregnancy. The results were 371 cases (0.5%) before pregnancy, 30 cases (0.04%) during pregnancy and 538 cases (0.7%) after pregnancy. In addition 506 (53.9%) of the total hypothyroid cases were multiparous (Andersen et al., 2016).

In a cross sectional study conducted in Gaza, Radi and Shubair (2010) claimed that there was no statistically significant relationship between thyroid function in pregnancy and family history of thyroid problems. In addition, Alkafajei et al., (2012) evaluated the prevalence and risk factors for hypothyroidism in Jordanian women. There was also no association between hypothyroidism in pregnancy and risk factor like educational level, occupation, parity, personal or family history of thyroid problems, diabetes mellitus and previous pregnancy complications. However, according to ATA and the Endocrine Society, multiple factors could be considered as risk factors for the development of hypothyroidism in pregnant ladies including age being more than 30 years, morbid obesity, positive antithyroid antibody, personal history of thyroid dysfunction, goiter, past history of thyroid surgery, radiotherapy in head and neck region, use of medication like amiodarone, symptoms of hypothyroidism, type 1 diabetes mellitus, presence of autoimmune diseases, past history of abortion, preterm delivery, family history of thyroid disease and infertility (Almandoz and Gharib, 2012). In addition the number of parities is positively correlated with the development of autoimmune thyroiditis which in turn increases chance of hypothyroidism (Friedrich et al., 2008).

Selenium supplementation decreases anti-thyroid antibody levels, so in pregnant women, it significantly lower the chance of postpartum thyroiditis and definitively hypothyroidism (Drutel et al., 2013). In polycystic ovarian disease, the prevalence of hypothyroidism was reported to be 2.5% as compared to control cases 1.25% (Sinha et al., 2013).

2.2.11 Signs and symptoms

Hypothyroidism may present with plenty of clinical signs and symptoms. The severity of these signs and symptoms depend on the degree of thyroid dysfunction and the duration of hypothyroidism (Gaitonde et al., 2012). Symptoms of hypothyroidism are often nonspecific, and are often very subjective (Almandoz and Gharib, 2012). These include weight gain, easy tiredness, decrease in concentration, depression, myalgia, and menorrhagia and other menstrual disturbances. Symptoms which could be more specific to hypothyroidism include constipation, cold intolerance, dry skin, proximal muscle weakness, and hair thinning or loss (Gaitonde et al, 2012).

Variation in the symptoms of hypothyroidism is also related to age and sex. Menstrual irregularities and sometimes infertility could be the only presentation of women with hypothyroidism. While in older patients, a decline in the cognitive may be the only presentation (Almandoz and Gharib, 2012). On examination the following findings could be seen including goiter, delayed relaxation phase of deep tendon reflexes, thin or brittle hair, dry skin, dull facial expressions and peripheral edema (Bello and Bakari, 2012). On electrocardiography the presentation may include bradycardia, and low voltage waves. Patients with severe hypothyroidism may present with pericardial effusion, pleural effusion, megacolon, and coma. Myxedema coma occurs rarely (Gaitonde et al., 2012).

2.2.12 Diagnosis and treatment

Initial screening is by measuring TSH level. If it is above normal range, the TSH should be repeated, in order to confirm the diagnosis within 2–8 weeks with a free T4 level. A free T4 level should be ordered to exclude the possibility of central hypothyroidism due to central causes (So et al., 2012). Measurement of thyroid peroxidase antibodies in patients of confirmed hypothyroidism could lead to the cause (Garber et al., 2012).

Thyroxin replacement therapy is the treatment for hypothyroidism and is usually for life. However, the cases of transient hypothyroidism especially drug induced may require no treatment or may require short course of thyroxin replacement (So et al., 2012). The average daily dose of thyroxine is 1.6 µg per kilogram body weight. However, in elderly and those with angina a lower initial dose should be started, as thyroid hormone may increase the risk of inducing angina or a myocardial infarction. An initial dose of 50 µg/day is appropriate for healthy patients and 25 µg/day or 12.5 µg/day for elderly people and those with history of angina (Devdhar et al., 2007).

2.2.13 Complications of hypothyroidism

Hypothyroidism was associated with increased mortality in the older adults. Thyroid replacement therapy was associated with a reduction in the risk of death (Huang et al., 2018). Hypothyroidism is associated with cardiovascular dysfunction including decreased cardiac output, bradycardia, and decrease in left ventricular compliance with increased total peripheral vascular resistance (Gaitonde et al., 2012). Myxoedema can become complicated by multiple organ system failure, especially in elderly patients and those with cardiac, pulmonary, neurological, renal, and infectious diseases. The myxoedema coma is the extreme form of complicated hypothyroidism, and is associated with substantial mortality (Roberts and Ladenson, 2004). Clinical hypothyroidism in pregnancy has been associated with many complications like preeclampsia, gestational hypertension, fetal death, premature delivery, spontaneous abortions, recurrent abortions and cretinism (Granfors, 2015), in addition to anemia, low birth weight, stillbirth, and serious bleeding after the birth (Krishan and Randhir, 2011). Maternal hypothyroidism can increase the risk of fetal hypothyroidism (Mazumdar and Maji, 2008).

Chapter Three

Methodology

In this chapter the researcher presents the methodology used in this study. This includes, study design, study setting, period of the study, study population, sampling and sample size, eligibility criteria, study instrument, ethical and administrative consideration, pilot study, validity and reliability, data collection, and data entry and statistical analysis.

3.1 Study design

The design of this study is a case control study aiming to achieve the objectives of the study in identifying and exploring risk factors for hypothyroidism. The case control study is best applicable and practical to fit this situation with known outcome (hypothyroidism). It gives an opportunity to identify risk factors (exposure) supposed to have an effect on the outcome. Compared to prospective cohort studies they tend to be less costly and shorter in duration and large number of participants could be included in the study within short time period and needs less logistics.

3.2 Study setting

The study was carried out at the MOH hospitals which include, European Gaza hospital, Nasser hospital, Shohda Al-Aqssa hospital and Al-Shifa hospital.

3.3 Period of the study

The study was conducted in the period from October 2016 to December 2018.

3.4 Study population

The study population consisted of two groups: cases and controls. The cases were people who diagnosed with hypothyroidism and attended Endocrinology Clinics at MOH hospitals and the controls who did not have hypothyroidism and attended MOH hospitals for any reason. Matching between case and control groups was applied on the base of Governorate.

3.5 Sampling and sample size

Gaza strip is divided into five Governorates, North Gaza, Gaza, Mid- Zone, Khanyounis and Rafah Governorates. The sample was selected according to assigned MOH hospitals to each Governorate. In this study, the Epi info computer program version 7 calculator was used in order to determine the required sample size. The result was 148 cases and 148 controls, with power of 80% and alpha risk of 5%. To compensate for no response action the sample was increased to 150 cases matched with 150 controls.

Generally, the population of Gaza Strip is relatively considered as homogeneous community with low disparities, so the researcher decided to use convenient sampling by selecting four MOH hospitals:

- Al-Shifa hospital which serves Gaza and part of North Gaza Governorates,
- Shohda Al-Aqssa hospital which serves Mid- Zone Governorate,
- Nasser Hospital which serves Khanyounis Governorate and
- Gaza European Hospital which serves Rafah Governorate and eastern part of Khanyounis Governorate.

The required cases and controls for each hospital were enrolled in this study by quota sampling during the follow up visits in Endocrinology Clinics at the selected MOH hospitals.

Distribution of cases and controls among Governorates and MOH hospitals were based on the proportionate distribution of the population among the Governorates in Gaza Strip according to the PCBS (2018) that was as following: Gaza Governorate (34.4%), North Gaza Governorate (19.4%), Mid- Zone Governorate (14.4%), Khanyounis Governorate (19.5%) and Rafah Governorate (12.2%).

3.6 Eligibility criteria

Inclusion criteria

For cases:

- Cases of diagnosed hypothyroidism on replacement therapy with thyroxin at a dose of 50 μg or more.
- received the treatment for not less than 6 months
- aged 18 years old or more

For controls:

- Aged 18 years or more .
- No past or current history of hypothyroidism.

Exclusion criteria:

For cases:

1. hypothyroidism using replacement of thyroxin dose less than 50 microgram.
2. Who refuse to participate.
3. Age less than 18 years.
4. Treatment duration less than 6 months.

For control:

1. Client with past history of thyroid illness.
2. Age less than 18 years.
3. Who refuse to participate.

3.7 Study instruments

The researcher used structured questionnaire which constructed and organized in the base of study domains (Annex1). The study questionnaire reflected the study domains, objectives and contains personal data, socio-demographic characteristics (age, sex, area of residency, income, education, smoking), chronic medical diseases (presence of autoimmune diseases, DM and HTN), Family history risk factors (presence of DM , HTN and thyroid dysfunction in first relative degree), dietary risk factors (the diet variables were selected based on the study of Hassen & Ahmed, 2016), iatrogenic risk factors (which contains three parts first one for related surgical intervention to thyroid dysfunction, second for history of radioactive iodine exposure or radiotherapy and third for related drugs for thyroid dysfunction), and reproductive risk factors for females only which deals with gravidity, parity and infertility.

3.8 Ethical and administrative consideration

The researcher was committed to all ethical and administrative consideration. An ethical approval obtained from Helsinki committee which is adopted by the world medical assembly and an official letter of approval to conduct the research was obtained from the Helsinki committee-Gaza (Annex3). Academic approval was achieved from School of Public Health at Al-Quds University. Administrative approval was asked and obtained from Ministry of Health to conduct the study at selected MOH hospitals in Gaza Governorates (Annex4). Moreover, the study aim and objectives were explained to all participants and consent form was obtained before voluntary participation (Annex5).

3.9 Pilot study

It was carried out on a sample of 20 cases of hypothyroidism and 20 controls without hypothyroidism to clarify the validity and reliability of the questionnaire. The pilot study led to some changes in the study instrument and accordingly they were excluded from analysis.

3.10 Validity and reliability

3.10.1 Validity of questionnaire

The researcher submitted the questionnaire to ten experts in the fields of public health and endocrinology to evaluate the context and the components and domains of the instrument, to ensure validity and relevance and their feedback were taken in consideration.

3.10.2 Reliability

The following measures were done to assure instruments reliability:

1. Training of data collectors on questionnaire's techniques to ensure standardization of questionnaire filling.
2. The data entry filled in the same day of data collection, and this allowed for possible intervention to check the data quality or to re-fill the questionnaire when required.
3. Re-entry of 5% of data after finishing data entry were ensured correct entry procedure and decreased entry errors.

3.11 Data collection

Data were collected by the researcher himself and three data collectors by using structured face to face questionnaire at the selected MOH hospitals at the time of endocrinology clinics follow up visits. The researcher explained and trained the assistant data collectors regarding the study aim, objectives and questions. Time allocated for each interview was about 10-20 minutes.

3.12 Data entry and Statistical analysis

The obtained data of appropriate questionnaire was entered and analyzed by the researcher himself by using Statistical Package of Social Science (SPSS) program version 22 and according to the following steps:

1. Reviewing of the questionnaires domains and structure.
2. Coding of questions.
3. Data model entry design by SPSS.
4. Data cleaning.
5. Descriptive, analyzed and tabulated statistics as frequency and percentages were calculated.
6. Chi square test was used for categorical group to asses if there is significant difference between some risk factors (like family history, associated autoimmune diseases among cases and controls) and P values equal or less than 0.05 is considered as statistically significant to compare the results between the cases and controls.
7. t-test was used to compare the mean of other variables.
8. Simple logistic regression and fisher' exact test were applied.
9. OR with 95% CI were used to examine strength and significance of associations between variables, for example between smoking and hypothyroidism and between numbers of parities and hypothyroidism.

3.13 Study Limitations

The study had faced some limitations such as:

1. Accessibility of the data that may be not documented.
2. Absence of similar studies in Gaza Strip.
3. The frequent cutoffs of electricity.
4. Financial constrain.
5. Refusal of UNRWA permission.
6. Lack of complete data on hypothyroidism in Gaza Governorates.
7. Control cases were selected based on clinical manifestations.

Chapter Four

Result and Discussion

This chapter illustrates the results of statistical analysis of the data, including descriptive analysis that presents the socio-demographic characteristics of the study sample and the answers to the questions of the study. The researcher used statistical procedures such as frequencies, percentages, mean, standard deviation, and some statistical tests such as Chi-square, Odds Ratio, Fisher's exact test, independent sample t-test and simple logistic regression.

4.1 Descriptive analysis of socio-demographic characteristics

The study population consisted of 300 participants; 150 cases with hypothyroidism and 150 controls without hypothyroidism. The total number of females was 249; 136 cases and 113 controls, while, the total number of males was 51; 14 cases and 37 controls.

4.1.1 Distribution of the study population by health facility

Table 4.1: Distribution of the study population by health facility

Type of subject		**Cases n (%)**	**Control n (%)**	**Total n (%)**
Hospital	European Gaza Hospital	30 (20%)	30 (20%)	60 (20%)
	Naser Hospital	25 (16.6%)	25 (16.6%)	50 (16.6%)
	Shohda Al-aqsa Hospital	25 (16.7%)	25(16.7%)	50 (16.7%)
	Al-shifa hospital	70 (46.6%)	70 (46.6%)	140 (46.6%)
	Total	150 (100%)	150 (100%)	300 (100%)

Table (4.1) shows the distribution of the study participants among various hospitals in Gaza Strip; 140 (46.6%) from Al-shifa hospital, 60 (20%) from European Gaza hospital, 50(16.7%) from Shohda Al-aqsa hospital and 50 (16.6%) from Naser hospital. This implies that the highest percentage of cases was from Al-shifa hospital, where the lowest were from Naser and Shohda Al-aqsa hospitals.

4.1.2 Distribution of the study population by the Governorates

Table 4.2: Distribution of the study population by the Governorates

Type of subject		Cases N (%)	Control N (%)	Total N (%)
Governorate	Rafah	22 (14.7%)	22 (14.7%)	44 (14.7%)
	Khanyounis	33 (22%)	33 (22%)	66 (22%)
	Mid-Zone	25 (16.7%)	25 (16.7%)	50 (16.7%)
	Gaza	56 (37.3%)	56 (37.3%)	112 (37.3%)
	North	14 (9.3%)	14 (9.3%)	28 (9.3%)
	Total	150 (100%)	150 (100%)	300 (100%)

Table (4.2) presents the distribution of the study sample among Governorates. The highest proportion was recorded for Gaza Governorate with 112 (37.3%), followed by 66 (22%) from Khanyounis Governorate, Mid-Zone 50 (16.7%), Rafah 44 (14.7%) and 28 (9.3%) from North Gaza Governorate. The researcher tried to make selection in semi proportionate manner to the proportional distribution of the population between Governorates of Gaza Strip according to PSCB (2018).

4.1.3 Distribution of the study population by the type of residency

Table 4.3: Distribution of the study population by the type of residency

Type of subject		Cases N (%)	Control N (%)	Total N (%)
Residency	City	74 (49.3%)	78 (52%)	152 (50.7%)
	Village	33 (22%)	23 (15.3%)	56 (18.7%)
	Camp	43 (28.7%)	49 (32.7%)	92 (30.7%)
	Total	150 (100%)	150 (100%)	300 (100%)

Table (4.3) shows that 152 (50.7%) of all participants: 74 (49.3%) cases and 78 (52%) controls live in cities. Ninety two (30.7%) of all participants: 43 (28.7%) cases and 49 (32.7%) of controls live in camps. However, the lowest number was observed for village population 56 (18.7%). UNRWA (2018) outlined that the percentage of Palestinian people who live in refugees camps in Gaza Governorates was 38.6% during 2017.

4.1.4 Mean age of the study population

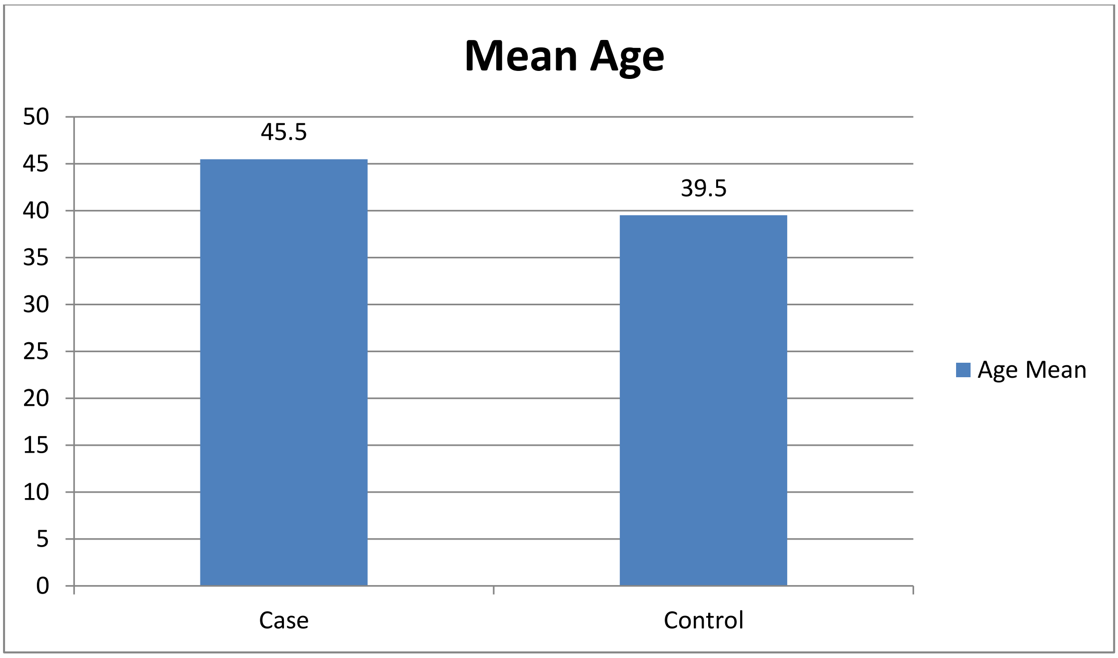


Figure 4.1: Mean age of the study population

Figure (4.1) indicates that the mean age of the case group was 45.5±13.8 with maximum and minimum ages 80 and 18 years respectively and the age mode was 37 years. The mean age of control group was 39.5±14.5 with maximum and minimum ages of 85 and 18 years respectively and the age mode was 27 years. Such data coincide with that of Al-Sumry et al. (2015) who showed that the mean age was 40 years for overt hypothyroidism.

4.1.5 Distribution of study the population by gender

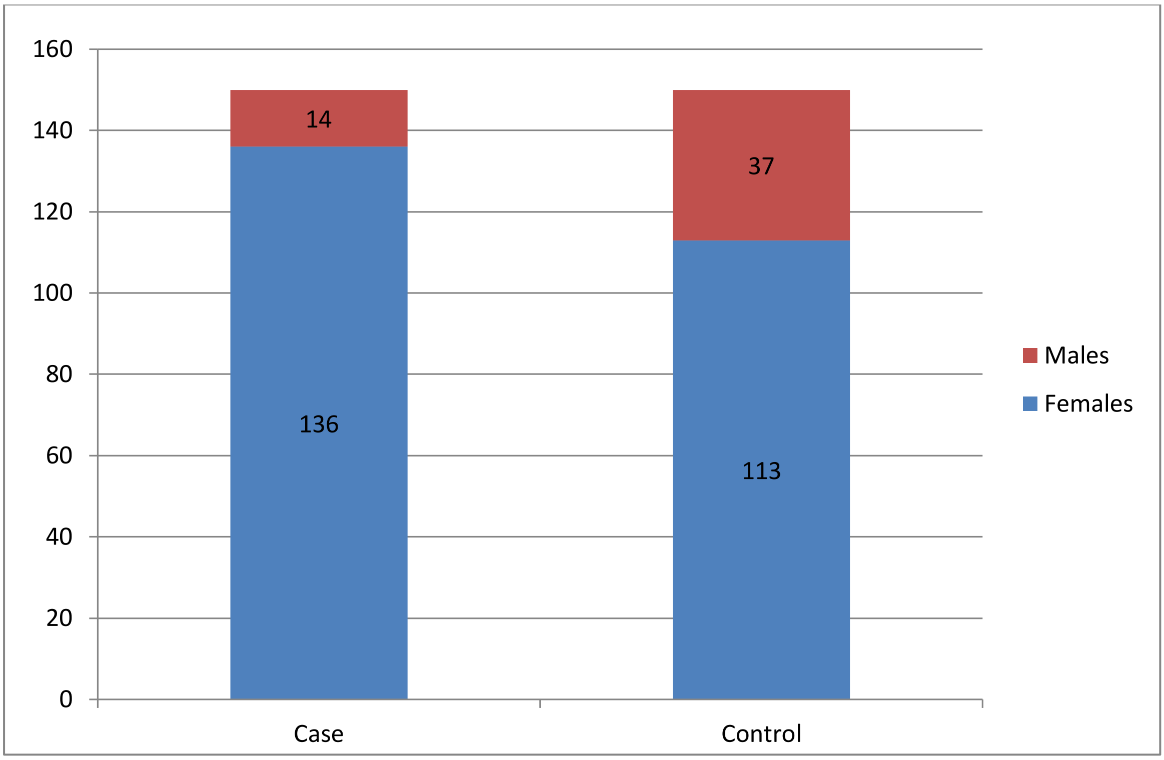


Figure 4.2: Distribution of the study population by gender

Figure (4.2) shows that 249 (83%) of all participants were females and 51 (17%) were males. Among the cases 136 (90.7%) were females and 14 (9.3%) were males. This is in line with results of a descriptive study conducted in Baghdad by Hassen and Ahmed (2016) who showed that the majority of the study sample for hypothyroidism were females (96%). Among the controls 113 (75.3%) were females and 37 (24.7%) were males. For the control this may also reflect that high percentage of the visitors of the hospital were females and their acceptance to participate in the study was higher as compared to male clients. Generally, women more frequently seek medical services than men for thyroid condition and for other problems (Olmos et al., 2015).

4.1.6 Distribution of the study population by family type

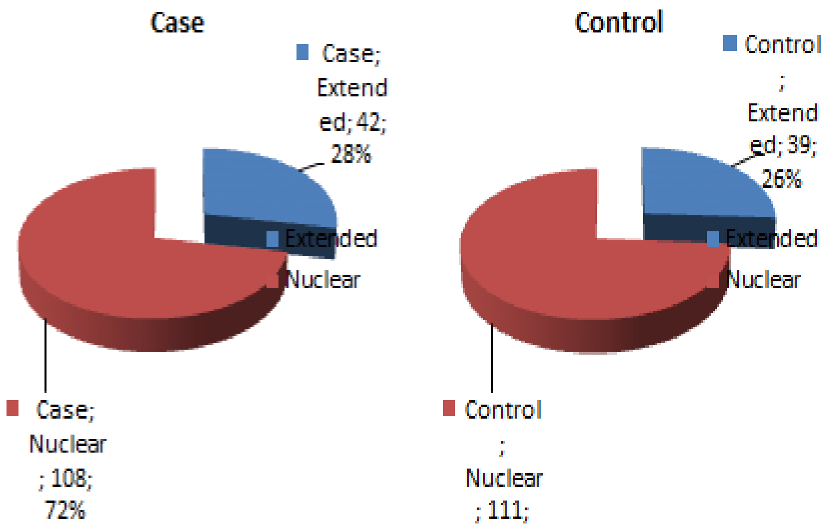


Figure 4.3: Distribution of the study population by family type

Figure (4.3) shows that 81 (27%) of all participants were living within extended families while 219 (73%) of all participants were living within nuclear families. Among cases, 42 (28%) were living within extended families and 108 (72%) were living within nuclear families. Regarding controls, 39 (26%) were living within extended families and 111 (74%) were living within nuclear families. According to PCBS (2017), the nuclear household was 84.7% and the extended household was 12.4% in Gaza Strip. The difference with our result may indicate the need to have larger sample size.

4.1.7 Distribution of the study population by average family size

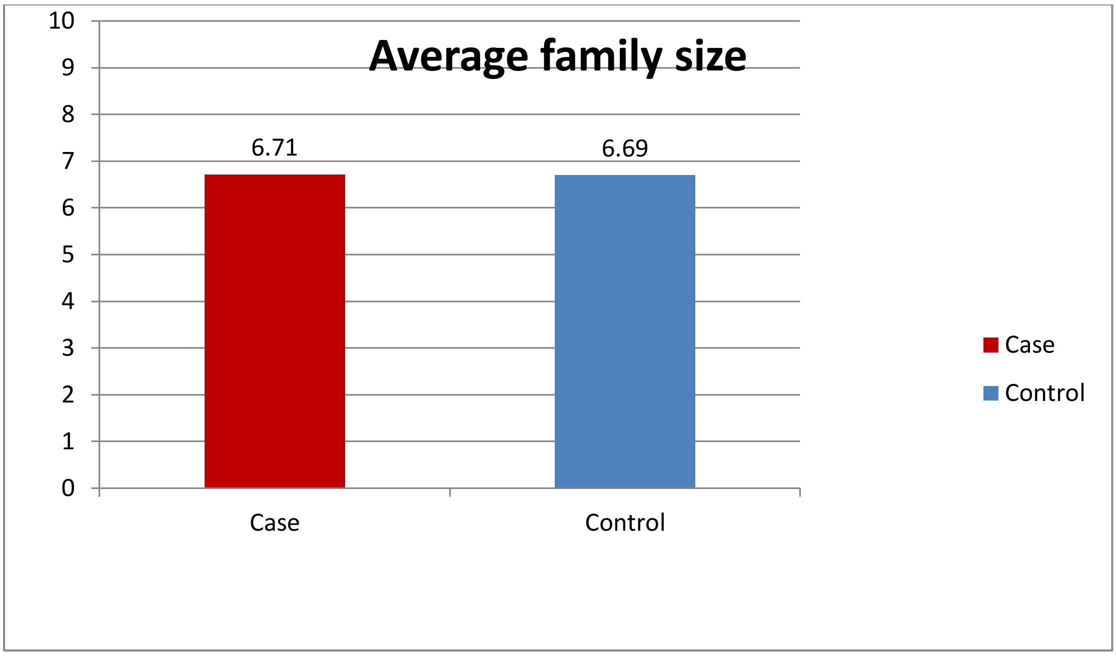


Figure 4.4: Distribution of the study population by average family size

Figure (4.4) shows that the average family size of cases 6.71 with maximum and minimum family size of 17 and 1, respectively, and the family size mode was 7. For controls, the average family size was 6.69 with maximum and minimum family size of 13 and 1 respectively, and the family mode was 6. Such average family sizes were relatively higher than that in PCBS (2017) and UNRWA (2018) records of 5.7 and 5.6, respectively. This difference in the average family disease could be explained by the fact that both PCBS and UNRWA are based on census which is more representative.

4.1.8 Distribution of the study population by educational level

Table 4.4: Distribution of the study population by educational level

Education level	Cases N (%)	Control N (%)	Total N (%)
Illiterate	7 (4.7%)	6 (4.0%)	13 (4.3%)
Can read and write	4 (2.7%)	1 (0.7%)	5 (1.7%)
Elementary school	14 (9.3%)	9 (6.0%)	23 (7.7%)
Preparatory school	52 (34.7%)	31 (20.7%)	83 (27.7%)
Secondary school	36 (24.0%)	23 (15.3%)	59 (19.7%)
Associate Diploma	15 (10.0%)	16 (10.7%)	31 (10.3%)
Bachelor and above	22 (14.7%)	64 (42.7%)	86 (28.7%)
Total	150 (100%)	150 (100%)	300 (100%)

Analysis of the educational level of the study population showed that 22 (14.7%) cases and 64 (42.7%) controls had bachelor degree or above, 15 (10.0%) cases and 16 (10.7%) controls had associate diploma, 36 (24.0%) cases and 23 (15.3%) controls had a level of secondary school, 52 (34.7%) cases and 31 (20.7%) controls had a level of preparatory school and 14(9.3%) cases and 9 (6.0%) controls had a level of primary school. Cases and controls who only can read and write were 4 (2.7%) and 1 (0.7%), respectively. In addition, 7 (4.7%) cases and 6 (4.0%) controls were illiterate (Table4.4). This reflects a well-educated community and such educational distribution is more or less similar to that reported by PCBS (2017).

4.1.9 Distribution of the study population by employment status

Table 4.5: Distribution of the study population by employment status

Employment	Case N (%)	Control N (%)	Total N (%)
Employed	50 (33.3%)	75 (50%)	125 (41.7%)
Unemployed	100 (66.7%)	75 (50%)	175 (58.3%)
Total	150 (100%)	150 (100%)	300 (100%)

Table (4.5) presents that 41.7% of all participants; 33% of cases and 50% of controls are employed. However, 58.3% of all participants; 66.7% of cases and 50% of controls are unemployed. PCBS (2017) declared that the unemployment rate in Palestine during 2016 was 41.7%. With the current harsh situation in Gaza Strip unemployment becomes much higher specially during the year 2018.

4.1.10 Distribution of the study population by monthly family income by Jordanian Dinar

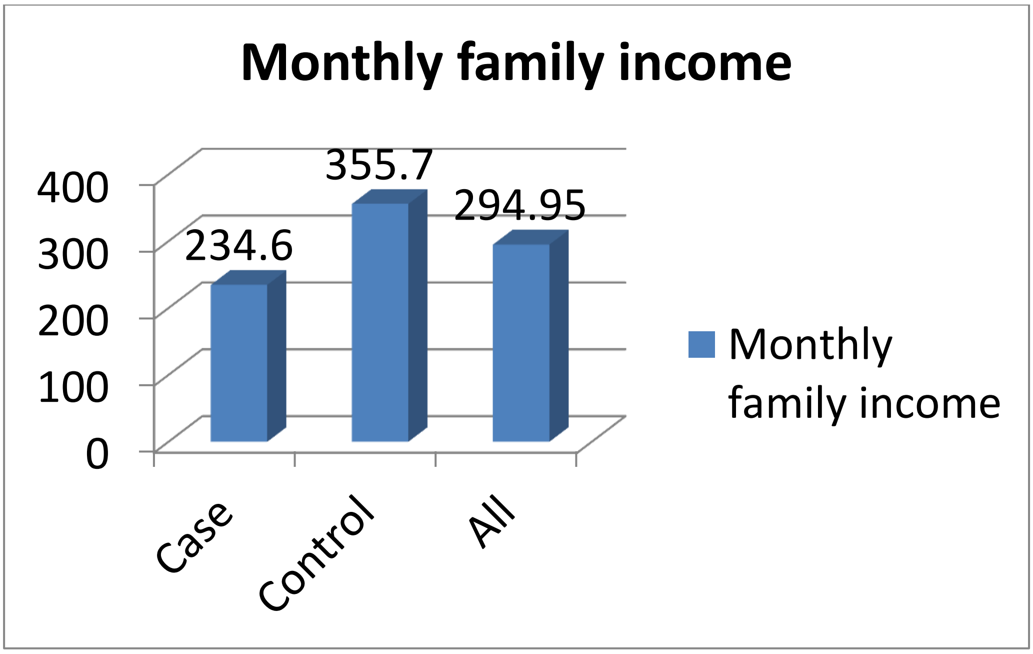


Figure 4.5: Distribution of the study population by average monthly family income.

Figure (4.5) presents that the average monthly family income of cases was 234.6 Jordanian Dinar (JD) and that of controls was 355.7 JD. According to the PCBS (2017) the average monthly income by JD in Gaza during 2016 was 279.6 JD which is in the same range of our result.

4.1.11 Distribution of the study population by smoking status

Table 4.6: Distribution of the study population by smoking status

Smoking status	**Cases N (%)**	**Control N (%)**	**Total N (%)**
Non-smoker	88 (58.7%)	101 (67.3%)	189 (63%)
Past-smoker	3 (2.0%)	4 (2.7%)	7 (2.3%)
Passive smoker	53 (35.3%)	37 (24.7%)	90 (30%)
Smoker	6 (4.0%)	8 (5.3%)	14 (4.7%)
Total	150 (100%)	150 (100%)	300 (100%)

Table (4.6) indicates that 189 (63%) of all participants; 88 (58.7%) cases and 101 (67.3%) controls were non-smoker. Fourteen (4.7%) of all participants; 6 (4.0%) cases and 8 (5.3%) controls were smokers. Seven (2.3%) of all participants; 3 (2.0%) cases and 4 (2.7%) controls were past-smokers. However, 90 (30%) of all participants; 53 (35.3%) cases and 37 (24.7%) controls were passive smokers. The fact that most of the participants were females and smoking is culturally rare among females may explain that the majority of the participants are either non-smokers or passive smokers.

4.1.12 Iatrogenic related factors and hypothyroidism

4.1.12.1 Surgical history related factors and hypothyroidism

Table 4.7: Thyroidectomy among the study population

Factor		**Case N (%)**	**Control N (%)**
Thyroidectomy	Yes	39 (26)	0 (0)
	No	111 (74)	150 (100)
Type of thyroidectomy	Partial	11 (28.2)	0 (0)
	Total	28 (71.8)	0 (0)

Surgical history of participants shows that 63 (42%) of cases underwent fine needle aspiration biopsy. Table (4.7) presents that 39 (26%) of case group participants had thyroidectomy; 11 (28.2%) of them had partial thyroidectomy and 28 (71.8%) had total thyroidectomy. In other word the cases who had total thyroidectomy were more than cases who had partial thyroidectomy. These results are in agreement with the result of a prospective study to follow 82 cases post hemi-thyroidectomy to evaluate the occurrence of hypothyroidism. It was shown that 18% of cases developed hypothyroidism, there were no relationship between age, sex or weight of resected tissue and the risk of hypothyroidism (Wormald et al., 2008). A meta-analysis study showed that approximately one in five patients would develop hypothyroidism after hemi thyroidectomy, with clinical hypothyroidism in one of 25 operated patients (Verloop et al., 2012). According to a study in Saudi Arabia the occurrence of hypothyroidism among cases of hemi thyroidectomy may reach to 45% (Al-Shalhoub and Al-Dhahri, 2017).

Table (4.8) Causes of thyroidectomy

Cause of thyroidectomy	**Cases**	**Percent**
Diffuse goiter	9	23%
Partial thyroid enlargement	6	15.4%
Malignant thyroid tumor	16	41%
Benign thyroid tumor	7	18%
Hyperthyroidism	1	2.6%
Total	39	100%

Table (4.8) reveals that for the cases, the major indication for thyroidectomy was malignant thyroid tumor (41%), followed by diffuse goiter (23%) and benign thyroid tumor

(18%). The remaining cases were 15.4% due to nodular goiter and 2.6% of cases were due to hyperthyroidism. Approximately one third of patients with newly diagnosed overt hypothyroidism have received destructive therapy for hyperthyroidism (Vanderpump and Tunbridge, 2002).

4.1.12.2 Exposure to radioactive iodine among case group of hypothyroidism

Table (4.9) Radioactive iodine exposure among case group

Factor		N	%
Radioactive Iodine exposure	Yes	14	9.3
	No	136	90.7

Table (4.9) revealed that 9.3% of cases were exposed to radioactive iodine. Twelve of exposed cases were exposed to radioactive iodine for therapeutic purpose and the rest. Two cases were exposed for diagnostic and therapeutic purposes. The main cause of iodine exposure was the management of thyroid tumor. The number of radioactive iodine session was variable between cases; maximum number of session was 12, while minimum number of sessions was 1 session. The average period by months between radioactive iodine exposure and the diagnosing of hypothyroidism was 6.4 months with maximum duration was 24 months and minimum duration of 1 month. Twelve of exposed cases had undergone partial thyroidectomy before radioactive iodine exposure. The above results are in consistent with the results of a study for patients who received radioactive therapy, the hypothyroidism was transient in 58%. However, 70% of those with transient hypothyroidism became permanently hypothyroid in the subsequent 2 to 11 years (Mumtaz et al., 2009). In addition, a systematic overview and meta-analysis of 33 studies reporting data on hypothyroidism after radiation therapy showed that surgery involving the thyroid gland (OR 8.3; 95% CI, 5.7-12.0; $P < .00001$), was associated with a higher risk of hypothyroidism (Vogelius et al,. 2011). In our study 12 of the exposed cases had undergone partial thyroidectomy before radioactive iodine exposure which increased the risk of hypothyroidism.

4.2 Inferential analysis

4.2.1 Association between socio-demographic characteristics and hypothyroidism

Table (4.10) Relationship between participants' age and hypothyroidism

Variable	Research category	Number	Mean	Standard deviation	Mean diff	t-test	p-value
Age (year)	Case	150	45.5	13.8	5.926	3.625	0.000
	Control	150	39.5	14.5			

Table (4.7) shows that the mean age of case group is higher than the mean age of the control group by 5.9 year difference. t-test revels that there are statistical significant differences between case and control groups in their mean age regarding occurrence of hypothyroidism. The mean age for case group was higher (45.5 ±13.8 years) than control group (39.5 ±14.5 years) with t=3.625 and p=0.000. The study result is consistent with the result of an Indian study in which the mean age of the study population was 41.1 ± 14.0 years (Sethi et al., 2017). However a study conducted in Baghdad showed that 32% of cases were between 28-37 years (Hassen and Ahmed, 2016). This is in contrast to result of Gurevitz et al. (2011) study, that hypothyroidism is more common in people over the age of 60 years. The discrepancy of the results makes the researcher to think that age-related hypothyroidism might be explained by a normal physiologic response to aging, decreased sensitivity of the thyroid gland to TSH, or the increased prevalence of thyroid autoantibodies with aging.

4.2.2 Association between gender, marital status, type of family, smoking status and hypothyroidism

Table (4.11) Association between gender, marital status, type of family, smoking status and hypothyroidism

socio-demographic Factor		Case n (%)	Control n (%)	χ^2 (df)	OR (95%CI)	*p* Value
Gender	Male®	14 (9.3)	37 (24.7)	12.884 (1)	1.00	
	Female	136 (90.7)	113 (75.3)		3.181 (1.63 – 6.17)	0.001
Marital status	Single®	18 (12)	16 (10.7)	2.197 (3) (Fisher's exact test value: 2.24 , *p*:0.553)	1.00	
	Married	114 (76)	123 (82)		0.82 (0.40 – 1.69)	0.598
	Divorced	2 (1.3)	1 (0.7)		1.778 (0.14 – 21.5)	0.651
	Widow	16 (10.7)	10 (6.7)		1.42 (0.50 – 4.01)	0.506
Type of family	Nuclear®	108 (72)	111 (74)	0.152 (1)	1.00	
	Extended	42 (28)	39 (26)		1.107 (0.66 – 1.84)	0.696
Smoking status	Non-smoker®	88 (58.7)	101 (67.3)	4.185 (3) (Fisher's exact test value: 4.22, *p*:0.228)	1.00	
	Past-smoker	3 (2)	4 (2.7)		0.86 (0.18 – 3.95)	0.847
	Passive smoker	53 (35.3)	37 (24.7)		1.64 (0.98 – 2.73)	0.055
	Smoker	6 (4)	8 (5.3)		0.86 (0.28 – 2.57)	0.789

® Reference group

Table (4.11) demonstrates a statistical significant association between gender and hypothyroidism (χ^2=12.884, p=0.001); females are 3 times at risk of hypothyroidism as compared with males (OR: 3.181 CI: 1.63 – 6.17). This finding in line with the results of Framingham study which showed that women exhibited hypothyroidism (5.9%) more often than men (2.3%) with a ratio 2.5:1 (Bensenor et al., 2012). However in another study the ratio was higher; women were 5-8 times more likely to develop hypothyroidism than men (Gurevitz et al., 2011). There were no statistical significant association between marital status, type of family, smoking status and hypothyroidism. Literature review showed that there were no associations between marital status, type of family and hypothyroidism. However, the relation between hypothyroidism and smoking is controversial (Müller et al., 1995). According to Pontikides and Krassas (2002), there was no relation between hypothyroidism and smoking which is in agreement with our result. Also, in the Gothenburg study, thyroid hormones displayed no difference between smokers versus non-smokers ($P > 0.05$) (Petersen et al., 1991). In addition, smoking was not associated with a reduction in risk of hypothyroidism in a study of euthyroid women; for former smokers the result was (OR: 0.86, CI:0.55-1.36) while for current smoker the result was (OR:0.59, CI:0.32-1.07) (Walsh et al., 2010). On the other hand, several studies were in line of an inverse association between smoking and hypothyroidism. Laurberg et al., (2013) found that quitting smoking increase the risk of developing hypothyroidism (OR: 5 , 95% CI), while those currently smoking or never smokes are protected (OR 0.9, CI:). Also, Effraimidis et al. (2011) and Wiersinga (2013) found that smoking has protective effect against the autoimmune thyroiditis. However, other study indicated that smoking is a risk factor of hypothyroidism (Duntas LH, 2008). The researcher believes that such result was not shown in this study due to the cultural issue which limits the smoking among female who represent the main risk groups for hypothyroidism, in addition such protective action of smoking is known in literature for some autoimmune diseases like crohn's disease.

4.2.3 Association between residency area, educational level, employment and hypothyroidism

Table (4.12) Association between residency area, educational level, employment and hypothyroidism

Socio-demographic Factor		Case N (%)	Control N (%)	χ2 (df)	OR (95%CI)	*p* Value
Residency	City®	74 (49.3)	78 (52.0)	2.29 (2)	1.00	
	Village	33 (22)	23 (15.3)		1.51 (0.81 – 2.81)	0.191
	Camp	43 (28.7)	49 (32.7)		30.92 (10.55 – 1.55)	0.768
Educational level	Elementary and less	25 (16.7)	16 (10.7)	26.39 (2)	3.378 (1.61 – 7.07)	0.001
	Preparatory and Secondary school	88 (58.7)	54 (36.0)		3.52 (2.10 – 5.90)	0.000
	Diploma and above®	37 (24.7)	80 (53.3)		1	
Employment	Employed®	50 (33.3)	75 (50.0)	8.618 (1)	1.00	
	Unemployed	100 (66.7)	75 (50.0)		2 (1.25 – 3.18)	0.004

®: Reference group

Table (4.12) points out a statistical significant association between employment and hypothyroidism (χ^2 =8.618, p=0.004). The unemployed participants are 2 times at risk of hypothyroidism more than employed to have hypothyroidism (OR: 2, CI: 1.25 – 3.18). This is different from the result of some studies which expressed no association between hypothyroidism and employment like a study conducted among pregnant women which showed no relation between employment and hypothyroidism (Alkafajei et al., 2012). In contrast, other studies concluded an association between some occupation and hypothyroidism as described by Moon et al. (2016) who found that night shift workers exhibited a 1.399 fold higher risk of subclinical hypothyroidism (95 % CI: 1.050–1.863, p = 0.022). Another study showed higher risk for hypothyroidism among employee working administrative work, with TSH level (5.23±0.52 mU/l) as compared to those of academic work with TSH (5.12±0.52 mU/l) (Cheserek et al., 2014). The researcher thinks that such relation could be affected by other factors like low level of education which could affect the life style and dietary habits. In addition this point could be an area for further research to explore the relation between employment and hypothyroidism.

Concerning education, a statistical significant association was found between educational level and hypothyroidism (χ^2 =26.39, $p<0.05$). There were significant associations between groups of elementary education and less group and preparatory and secondary group with hypothyroidism (OR:3.37, CI:1.61 – 7.07) and (OR:3.52, CI: 2.10 – 5.90) respectively in comparison to the diploma and above group. This contradicts the result of Olmos et al. (2015) who showed that patients with overt hypothyroidism had more years of education and higher net family income than the other groups (both $P<0.0001$). This was shown in another study which refer to higher education as predictor of hypothyroidism; odds ratio was 1.45 with reference to low education (Tonstad et al., 2013). However, most studies showed that no relation existed between educational level and hypothyroidism (Alkafajei et al., 2012). In this context, Chen, et al.(2017) showed that iodized salt use was lower among less educated Vietnam women (OR: 0.34; 95% CI: 0.16–0.71). This might give a hint about effect of education on diet which in turn may affect the hypothyroidism. In addition the researcher thinks that low educated people usually have lower income which may increase stress specially in the current situation in Gaza, as well as low educated might be subjected to different social determinants of health. This may open the door for further researches to study indirect relation between education, income and stress. The table also shows that there is no statistical significant association between residency and hypothyroidism as the different residency types in Gaza are almost has limited differences with same geographical nature.

4.2.4 Relationship between mean family size, mean monthly family income and hypothyroidism

Table (4.13) Relationship between mean family size, mean monthly family income and hypothyroidism

Variable	Research category	Number	Mean	Standard deviation	Mean diff.	t-test	p-value
Mean family size	Case	150	6.71	3.09	0.2667	0.079	0.937
	Control	150	6.68	2.72			
Mean monthly family income (J. D)	Case	145	234.6	269.2	121.08	1.199	0.231
	Control	144	355.7	1885.6			

Table (4.13) demonstrates no statistical significant differences between the mean family size and mean monthly income for the case and control groups regarding the occurrence of hypothyroidism ($p>0.05$). Such results are consistent with that obtained by Alkafajei et al. (2012). In contradiction, Olmos et al. (2015) showed that patients with overt hypothyroidism have higher net family income than the other groups ($P<0.0001$).

4.2.5 Association between family history related factors and hypothyroidism

Table (4.14) Association between family history related factors and hypothyroidism

Family history related factor		**Case N (%)**	**Control N (%)**	**χ2 (df)**	**OR (95%CI)**	***p* Value**
Family H/O HTN	Yes	96 (64)	101 (67.3)	0.37 (1)	0.862 (0.53 – 1.39)	0.543
	No®	54 (36)	49 (32.7)		1	
Family H/O DM	Yes	84 (56)	70 (46.7)	2.619 (1)	1.455 (0.92 – 2.29)	0.106
	No®	66 (44)	80 (53.3)		1	
Family H/O thyroid disease	Yes	55 (36.7)	12 (8)	37.87 (1)	6.658 (3.38 – 13.10)	0.000
	No®	95 (63.3)	138 (92)		1	
No. of affected family members by thyroid disease	No®	95 (63)	138 (92)	42.2 (2) (Fisher's exact test value: 40.3 *p*:0.000)	1	
	1	35 (23.3)	11 (7.3)		4.62 (2.23 – 9.55)	0.000
	Two or more	20 (13.3)	1 (0.7)		29.05 (3.83 – 220.1)	0.001

H/O HTN: history of Hypertension, H/O DM: history of Diabetes mellitus.

®: Reference group

Table (4.14) presents a statistical significant association between family history of thyroid disease and hypothyroidism (χ^2 =37.87, p=0.000); the participants with family history of thyroid diseases are 6.7 times at risk of having hypothyroidism as compared to those with no family history of thyroid diseases (OR: 6.658; CI: 3.38 – 13.10). Endocrine Society and the ATA stated that family history of thyroid disease is a risk factor for hypothyroidism (Almandoz and Gharib, 2012). Similarly, Gaitonde et al. (2012) considered that family history of thyroid disease is a risk factor for hypothyroidism. In addition another study indicated that overt hypothyroidism is strongly associated with family history of thyroid diseases (OR:1.76; CI: 1.07-2.88) (Aminorroaya et al., 2017). Conversly, Vanderpump et al., (1995) stated that the presence of a positive family history of any form of thyroid disease was not associated with an increased risk of developing hypothyroidism. In a study conducted by Canaris et al. (2013) to identify risk factors of hypothyroidism, they found that 40% of the 794 participants reported a family history of thyroid disease. Also a statistically significant relationship was recorded between the number of family members who has thyroid disease and hypothyroidism (χ^2 =42.2, $p<0.05$). Participants of case group who had family history of one member only affected by thyroid disease are 4.6 times at risk of having hypothyroidism more than control group (OR: 4.62; CI: 2.23 – 9.55). If more than one family member has thyroid disease, the odds ratio increased (OR: 29, CI: 3.83 – 220.1). These findings in agreement with that exhibited by Leung (2017) who showed that first degree family members of patients with hypothyroidism were having nine fold increased risk of hypothyroidism. This might reflects the possibility of dose response effect that with increase in number of family members who have thyroid disease there is an increase in the risk of having hypothyroidism. On the other hand, there were no statistical significant associations between family history of DM, HTN and hypothyroidism ($p>0.05$).

4.2.6 Association between medical history related factors and hypothyroidism

4.2.6.1 Association between diabetes hypertension mellitus, and goiter, and hypothyroidism

Table (4.15) Association between diabetes hypertension mellitus, and goiter, and hypothyroidism

medical history related factors		**Case N (%)**	**Control N (%)**	**$\chi 2$ (df)**	**OR (95%CI)**	***p* Value**
HTN	Yes	47 (31.3)	28 (18.7)	6.47 (1)	1.988 (1.16 – 3.39)	0.012
	No®	103 (68.7)	122 (81.3)		1	
DM	Yes	33 (22)	14 (9.3)	9.33 (1)	2.74 (1.39 – 5.36)	0.003
	No®	117 (78)	136 (90.7)		1	
Goiter	Yes	75 (50)	5 (3.3)	96.16 (1)	29 (11.24 – 74.77)	0.000
	No®	75 (50)	145 (96.7)		1	

HTN: hypertension, DM: diabetes mellitus. ®: Reference group

Table (4.15) displays a statistical significant association between history of hypertension and hypothyroidism (χ^2 =6.47, p=0.012). The participant with hypertension are 2 times at risk for hypothyroidism as compared with those who have not (OR: 2 CI: 1.16 – 3.39). In a study conducted in India which involved 1500 newly diagnosed cases of hypothyroidism, comorbidities were reported in 545 patients (36.3%), of which hypertension was the second (11.3%) (Sethi et al., 2017). This result goes in the same line with the results of Iqbal et al., (2006) who reported a significant and positive relation between serum TSH and both systolic and diastolic blood pressure. In contradiction to that, a study conducted in Iran concluded that there was no significant association between serum TSH levels and blood pressure profile (Amouzegar et al., 2015). The researcher believes that there might be an association between medical history of hypertension and hypothyroidism, however this could be due to multiple risk factors like age which has association with both hypothyroidism and hypertension. Further studies are needed to explore more in this issue.

Regarding DM, a statistical significant association was also found between history of DM and hypothyroidism (χ^2 =9.33, p=0.003); participants with DM are 2.7 times at risk for having hypothyroidism in comparison with those how have not DM (OR: 2.7, CI: 1.39 – 5.36). In thier retrospective cross-sectional randomized primary and secondary care based study of 285 Omani type 2 diabetics aged $\geq$ 30 years, Al-Sumry et al.(2015) showed that the commonest thyroid dysfunction among diabetics was overt hypothyroidism (4.6%). In an Indian study which involved 1500 newly diagnosed cases of hypothyroidism, comorbidities were reported in 545 patients (36.4%), of which type 2 diabetes mellitus being the most prevalent (13.54%) (Sethi et al., 2017).

Moreover, there was a statistical significant association between presence of goiter and hypothyroidism (χ^2 =96.16, p=0.000); participants with goiter are 29 times at risk of having hypothyroidism as compared to those with no goiter (OR: 29 CI: 11.24 – 74.77). This is congruent with the results of a prospective study which included 107 patients over age 55 years, in which the development of definitive thyroid hypo function was significantly related to the presence of goiter ($P < 0.05$) (Di´ez and Iglesias, 2004).

4.2.6.2 Association between medical history of autoimmune disease and hypothyroidism

Table (4.16) Association between medical history of autoimmune disease and hypothyroidism

Variable		**Case N (%)**	**Control N (%)**	**Fisher's exact test *p*-value**
history of autoimmune disease	**Yes**	5 (3.3%)	3 (2)	0.361
	No	145 (96.7)	147 (98)	

As indicated in table (4.16) there was no statistical significant association between medical history of autoimmune diseases and hypothyroidism (p=0.361). This contradicts the study of Akamizu et al., (2012) who reported that a presence of autoimmune diseases, including Sjögren's syndrome, pernicious anemia, type 1 diabetes, rheumatoid arthritis, or lupus, celiac disease were positively associated with hypothyroidism. The inconsistency of the results might be explained by low prevalence of these diseases, so larger sample and other methodologies might be needed.

4.2.7.2 Relationship between drug intake and hypothyroidism.

Table (4.17) Relationship between drug intake and hypothyroidism

Variable	Research category	Number	Mean	Standard deviation	Mean diff.	t-test	p-value
Total antiacids intake	Case	15	1232	1479.5	1073.6	2.153	0.043
	Control	9	158.3	119.3			
Total iron intake	Case	23	747.3	835.6	391	2.190	0.033
	Control	33	356.3	499.3			
Total minipills intake	Case	2	270	127.2	-577.5	-1.039	0.357
	Control	4	847.5	737.4			
Total combined pills intake	Case	19	881.8	90.1	5.84	0.018	0.986
	Control	10	876	693			
Total propranolol intake	Case	7	818.5	1031.8	413.5	0.532	0.611
	Control	2	405	445.4			

Total intake was calculated by multiplying drug used duration (months) by 30 by drug dose (duration by month * 30 * dose). There was no any participant used lithium and one participant used amiodarone. Table (4.17) shows that the cases had higher intake of antiacids as compared to controls with mean difference of 1073.6 and significance level of <0.05. Also it shows that cases had exposed to iron intake more than the control with mean difference of 391 and significance level of <0.05. However there were no statistical significant differences between case and control groups in intake of drugs "combined pills and propranolol".

4.2.8 Relationship between reproductive history related factors and hypothyroidism

Table (4.18) Relationship between "gravidity, parity and abortion" and hypothyroidism

Variable	Research category	Number	Mean	Standard deviation	Mean diff.	t-test	p-value
Gravidity	Case	120	6.90	3.96	0.591	1.139	0.256
	Control	101	6.31	3.70			
Parity	Case	120	5.60	3.30	0.520	1.186	0.237
	Control	101	5.07	3.18			
Abortion	Case	120	1.29	1.66	0.182	0.840	0.402
	Control	101	1.10	1.54			

Table (4.18) displays no statistical significant differences between the two groups' means of gravidity, parity and abortion (p>0.05). Although the mean gravidity for case group was higher (6.9 ±3.9) than control group (6.3 ±3.7), there was no significant difference (p=0.256). The same trend was observed in parity (5.6 ±3.3 vs. 5.07 ±3.18, p=0.237). This result agreed with Khadem et al. (2012) who considered that the parity had no effect on thyroid hormones. Similar result was expressed by Alkafaje et al. (2012) who found no association between hypothyroidism and parity. In addition, Kumari and Singh (2018) showed no significant statistical difference with respect to parity in different groups. However, in contradiction to that, a positive correlation had been shown between parity and hypothyroidism (Friedrich et al., 2008). Concerning abortion, the mean of case group was also higher (1.29 ±1.66) than control group (1.1 ±1.54) with (p=0.402).

Table (4.19) Association between post-partum thyroiditis and hypothyroidism

Factor		**Case N (%)**	**Control N (%)**	**χ2 (df)**	**OR (95%CI)**	***p* Value**
Postpartum thyroiditis*	Yes	27 (18)	3 (2)	26.38 (1) (Fisher's exact test value: 25.34 *p*:0.000)	9.587 (2.81 – 32.67)	0.000
	No®	92 (61.3)	98 (65.3)		1	
*males and single females were excluded from analysis						

Table (4.19) demonstrates a statistically significant association between history of PPT and hypothyroidism. Participants with history of post-partum thyroiditis were 9.6 times at risk of developing hypothyroidism in comparison with participants with no history (OR: 9.58 CI: 2.81 – 32.67) and reach significant level (χ^2=26.38, p=0.000). Stegall et al. (2014) showed that female is at higher risk for hypothyroidism if she is a postpartum woman. This coincide with study of Hernández and Domínguez (2013) who declared that many women develop permanent hypothyroidism sometime during the 3 to 10 year period after an episode of PPT.

4.2.9 Relationship between dietary history related factors and hypothyroidism

Table 4.20-A Relationship between dietary history related factors and hypothyroidism

Factor		Case N (%)	Control N (%)	χ2 (df)	OR (95%CI)	*p* Value
Red meat	3 times and more weekly	14 (9.3)	29 (19.3)	19.301 (3)	0.184 (0.065 – 0.517)	0.001
	1-2 times weekly	37 (24.7)	57 (38)		0.247 (0.099 – 0.616)	0.003
	Less than once weekly	78 (52)	56 (37.3)		0.531 (0.219 – 1.284)	0.160
	Never®	21 (14)	8 (5.3)		1.00	
White meat	3 times and more weekly	9 (6)	11 (7.3)	2.362 (3) (Fisher's exact test value:2.428 *P*:0.519)	0.409 (0.032 – 5.27)	0.493
	1-2 times weekly	108 (72)	116 (77.3)		0.466 (0.042 – 5.20)	0.535
	Less than once weekly	31 (20.7)	22 (14.7)		0.705 (0.060 – 8.26)	0.780
	Never®	2 (1.3)	1 (0.7)		1.00	
Fish	3 times and more weekly	9 (6)	3 (2)	5.218 (3) (Fisher's exact test value:4.966 *P*:0.568)	1.941 (0.428 – 8.79)	0.390
	1-2 times weekly	38 (25.3)	38 (25.3)		0.647 (0.268 – 1.56)	0.333
	Less than once weekly	86 (57.3)	98 (65.3)		0.568 (0.252 – 1.27)	0.172
	Never®	17 (11.3)	11 (7.3)		1.00	

® Reference group

Table (4.20) shows a statistical significant association between eating red meat 3 times and more weekly and hypothyroidism (χ^2 =19.301, p=0.001) which considered as a protective factor (OR: 0.184 CI: 0.065 – 0.517). Also, there is a statistical significant association between eating red meat 1-2 times weekly and hypothyroidism (χ^2 =19.301, p=0.003). The participants of this group are protected from developing of hypothyroidism (OR: 0.247, CI: 0.099 – 0.616). Such findings are in consistent with a recent study of Esposito et al. (2016) found that supplementation of protein-rich diet for 3 weeks were significantly associated with a drop of sentinel autoantibodies in Hashimoto's thyroiditis and a slight significant increase in FT3. Meats are excellent sources of selenium which support the iodine action in preventing hypothyroidism (Mezzomo and Nadal, 2016). The nutritional counselor Dr. Ray Peat assumed that diets low in protein or composed of an imbalance of protein sources stress the body, causing suppression of the thyroid gland. This type of diet can also reduce the body's response to thyroid hormone supplements and further lower overall metabolism (Warren, 2017). However, a study conducted in Iraq showed medium association between meat intake and hypothyroidism (Hassen and Ahmed, 2016). In addition, vegan versus omnivorous diets tended to be associated with reduced risk with OR 0.89, 95% CI: 0.78–1.01, (Tonstad et al., 2013). This point need further exploration through prospective studies to determine the effect of meat intake. Although white meat and fish are rich in iodine and selenium which has protein action against hypothyroidism (Butler, 2018), there were no significant association between the frequency of eating these items and hypothyroidism. However, Hassan and Ahmad (2016) showed a low association between intake of white meat and hypothyroidism.

Table 4.20-B Relationship between dietary history related factors and hypothyroidism

Factor		Case N (%)	Control N (%)	χ2 (df)	OR (95%CI)	*p* Value
Milk	3 times and more weekly	47 (31.3)	71 (47.3)	16.734 (3)	0.395 (0.231 – 0.677)	0.001
	1-2 times weekly	16 (10.7)	8 (5.3)		1.194 (0.469 – 3.041)	0.710
	Less than once weekly	20 (13.3)	31 (20.7)		0.385 (0.194 – 0.764)	0.006
	Never®	67 (44.7)	40 (26.7)		1.00	
Cheese	3 times and more weekly	88 (58.7)	100 (66.7)	83.461 (3)	0.528 (0.184 – 1.51)	0.234
	1-2 times weekly	29 (19.3)	20 (13.3)		0.870 (0.272 – 2.77)	0.814
	Less than once weekly	23 (15.3)	24 (16)		0.575 (0.180 – 1.83)	0.351
	Never®	10 (6.7)	6 (4)		1.00	
Butter	3 times and more weekly	12 (8)	18 (12)	5.011 (3)	0.526 (0.238 – 1.16)	0.113
	1-2 times weekly	8 (5.3)	10 (6.7)		0.631 (0.237 – 1.68)	0.357
	Less than once weekly	40 (26.7)	51 (34)		0.619 (0.369 – 1.038)	0.069
	Never®	90 (60)	71 (47.3)		1.00	

® Reference group

Table (4.20-B) reveals a significant association between milk intake 3 times and more weekly and hypothyroidism (χ^2 =16.734, p=0.001) which considered as a protective factor for hypothyroidism (OR: 0.395 CI: 0.231 – 0.677). Similar trend was found for milk intake less than once weekly (χ^2 =16,734, p=0.006). These findings contradict with the result of Tonstad et al. (2013) in that lacto-ovo diet was associated with increased risk of hypothyroidism (OR 1.09, 95% CI: 1.01–1.18). In addition, Hassen and Ahmed (2016) stated that there is a medium degree association between hypothyroidism and milk intake. There were no statistical significant association between cheese, butter intake in any frequency and hypothyroidism. However, Hassen and Ahmed (2016) showed a high association between hypothyroidism and butter intake.

Table 4.20-C Relationship between dietary history related factors and hypothyroidism

Factor		Case N (%)	Control N (%)	χ2 (df)	OR (95%CI)	*p* Value
Lettuce	3 or more weekly	27 (18)	21 (14)	4.670 (3)	1.607 (0.783 – 3.29)	0.196
	1-2 times weekly	40 (26.7)	28 (18.7)		1.786 (0.930 – 3.42)	0.081
	Less than once weekly	47 (31.3)	56 (37.3)		1.049 (0.584 – 1.88)	0.872
	Never®	36 (24)	45 (30)		1.00	
Spinach	3 or more weekly	14 (9.3)	8 (5.3)	2.515 (3)	1.750 (0.612 – 5.00)	0.296
	1-2 times weekly	44 (29.3)	40 (26.7)		1.10 (0.530 – 2.28)	0.798
	Less than once weekly	70 (46.7)	80 (53.3)		0.875 (0.447 – 1.71)	0.697
	Never®	22 (14.7)	22 (14.7)		1.00	
Green pepper	3 or more weekly	57 (38)	73 (48.7)	6.698 (3)	0.691 (0.357 – 1.33)	0.271
	1-2 times weekly	24 (16)	28 (18.7)		0.758 (0.347 – 1.65)	0.488
	Less than once weekly	43 (28.7)	26 (17.3)		1.463 (0.696 – 3.07)	0.315
	Never®	26 (17.3)	23 (15.3)		1.00	
Peanuts	3 or more weekly	17 (11.3)	17 (11.3)	8.190 (3)	0.607 (0.274 – 1.34)	0.219
	1-2 times weekly	21 (14)	27 (18)		0.472 (0.232 – 0.862)	0.039
	Less than once weekly	56 (37.3)	72 (48)		0.472 (0.272 – 0.819)	0.008
	Never®	56 (37.3)	34 (22.7)		1	
Pineapple	3 or more weekly	3 (2)	6 (4)	12.052 (3) (Fisher's exact test value:11.30 *P*:0.008)	0.370 (0.089 – 1.52)	0.170
	1-2 times weekly	1 (0.7)	7 (4.7)		0.106 (0.013 – 0.878)	0.038
	Less than once weekly	50 (33.3)	66 (44)		0.560 (0.347 – 0.904)	0.018
	Never®	96 (64)	71 (47.3)		1	

® Reference group

As indicated in table (4.20-C), eating peanuts 1-2 times weekly and less than once weekly are significantly associated with hypothyroidism (χ^2 =8.19, p=0.039, p=0.008, respectively). These are protective factors for hypothyroidism (OR: 0.472CI: 0.232 – 0.862) and (OR:0.472 CI: 0.272 – 0.819), respectively. However, peanut contains goitrogen that interferes with thyroid synthesis (Thyroid UK, 2017). This significant association with protective effect against hypothyroidism is contradicting with other studies. Therefore, it is recommended to study this relation on larger sample and in prospective design if possible to explore this relation. There are also a statistical significant associations between eating pineapple 1-2 times weekly and less than once weekly and hypothyroidism (χ^2 =12.052, p=0.038, p=0.018 respectively). Eating pineapple 1-2 times weekly and less than once weekly are considered as protective factors for hypothyroidism (OR: 0.106 CI: 0.013 – 0.878 and OR: 0.560 CI: 0.347 – 0.904 respectively). These findings are supported by another study which reported that pineapple is a source of iodine (Salau et al., 2011). Hassen and Ahmed (2016) found a high association between pineapple consumption and hypothyroidism. There are no statistical significant association between eating lettuce, spinach, green pepper in any frequency and hypothyroidism (p>0.05).

Table 4.20-D Relationship between dietary history related factors and hypothyroidism

Factor		Case N (%)	Control N (%)	χ2 (df)	OR (95%CI)	*p* Value
Raisin	3 or more weekly	5 (3.3)	9 (6)	16.168 (3) (Fisher's exact test value:15.86 *P*:0.001)	0.325 (0.102 – 1.02)	0.056
	1-2 times weekly	6 (4)	15 (10)		0.234 (0.085 – 0.645)	0.005
	Less than once weekly	62 (41.3)	81 (54)		0.447 (0.273 – 0.734)	0.001
	Never®	77 (51.3)	45 (30)		1.00	
Sesame	3 or more weekly	18 (12)	13 (8.7)	9.365 (3)	0.892 (0.392 – 2.02)	0.785
	1-2 times weekly	17 (11.3)	22 (14.7)		0.498 (0.234 – 1.05)	0.069
	Less than once weekly	56 (37.3)	77 (51.3)		0.468 (0.275 – 0.799)	0.005
	Never®	59 (39.3)	38 (25.3)		1.00	
Walnuts	3 or more weekly	5 (3.3)	11 (7.3)	16.106 (3) (Fisher's exact test value:15.65 *P*:0.001)	0.294 (0.097 – 0.892)	0.031
	1-2 times weekly	4 (2.7)	13 (8.7)		0.199 (0.062 – 0.642)	0.007
	Less than once weekly	53 (35.3)	69 (46)		0.498 (0.305 – 0.811)	0.005
	Never®	88 (58.7)	57 (38)		1.00	
Cauliflo wer	3 or more weekly	10 (6.7)	6 (4)	2.276 (3)	2.262 (0.664 – 7.70)	0.192
	1-2 times weekly	58 (38.7)	52 (34.7)		1.514 (0.690 – 3.32)	0.301
	Less than once weekly	68 (45.3)	73 (48;7)		1.264 (0.588 – 2.718)	0.548
	Never®	14 (9.3)	19 (12.7)		1	
Cabbage	3 or more weekly	6 (4)	7 (4.7)	5.765 (3)	1.286 (0.314 – 5.26)	0.727
	1-2 times weekly	70 (46.7)	50 (33.3)		2.10 (0.800 – 5.51)	0.132
	Less than once weekly	66 (44)	81 (54)		1.222 (0.472 – 3.16)	0.679
	Never®	8 (5.3)	12 (8)		1	

® Reference group

Table (4.20-D) shows an inverse significant associations between eating raisin 1-2 times weekly and less than once weekly, and hypothyroidism (χ^2 =16.168, p<0.05), with protective odds ratio as (0.234 and 0.447 respectively), and p-values 0.005 and 0.001, receptively. Raisins is one of iodine source containing 6μg/30 gram (Dietitians of Canada, 2018). Therefore researcher thinks that raisin intake in good quanities (not on daily basis) may be a protective factor for hypothyroidism. Also, an inverse significant association was found between eating sesame less than once weekly and hypothyroidism (χ^2 =9.365, p=0.005). The participants of this group (eating sesame less than once weekly) might be protected from developing of hypothyroidism (OR: 0.468 CI: 0.275 – 0.799). The iodine value of sesame seed varied from 101.52 to 114.85g/100g which make it good source of iodine (Tunde-Akintunde et al., 2012). In addition sesame seed are rich in selenium (Sharma et al., 2014). Consequently this make these seeds a good protective agent against hypothyroidism. In the same context, an inverse association was recorded between eating walnuts in any frequency and hypothyroidism (χ^2 =16.106). Eating walnuts considered as a protective factor for all categories, for participants of case group who eat walnuts three times or more weekly (OR: 0.294 CI:0.097 – 0.892 p=0.031), 1-2 times weekly (OR: 0.199 CI: 0.062 – 0.642 p=0.007) and less than once weekly (OR: 0.498CI: 0.305 – 0.811 p=0.005). Walnuts are a good source of selenium; 1 ounce of dried walnuts has 5 micrograms of selenium, about 7% of the daily recommended value for this essential trace mineral (Roberts, 2017). The researcher thinks that eating walnut makes it a protector agent for hypothyroidism when combined with sufficient iodine intake. There were no statistical significant association between eating cauliflower and cabbage in any frequencies and hypothyroidism (p>0.05). The study result is consistent with Bajaj et al. (2016-A) who found that the goitrogenic potential of a plant or food depends upon the amount of active goitrogen present in it, while various procedures like soaking, washing, boiling and cooking can help in reducing the goitrogenic potency of these foods. In the same line, Fernando (2017) stated that it is time that the cabbage and goiter story is debunked and excluded from medical text books.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

This study aimed to determine the risk factors for hypothyroidism among people attending governmental hospitals in Gaza strip in order to reduce hypothyroidism related morbidities and improve population health. A case-control study was carried out among people in their medical visit at Al-shifa, Shohda Al-aqssa, Nasser and EuropeanGaza hospitals. The study sample consisted of two groups; the first was case group which consisted of 150 participants who diagnosed as having hypothyroidism and the second was control group which consisted of 150 participants with no hypothyroidism, matching was done for location in term of the same governorate. During study period all eligible cases from the selected hospitals were enrolled in the study with total sample size of 300 respondents. A validated constructed questionnaire with face to face interview was carried out to all respondents. 34.4%, 19.4%, 14.4%, 19.5% and 12.2%of the study population were from Gaza Governorate, North of Gaza governorate, Dier Al-Balhgovernorate, Khanyounis governorate and Rafah governorate respectively. Different statistical tests and analysis were used.

Among demographic risk factors; bivariate analysis showed that there were statistically significant positive associations between hypothyroidism and the factors " age, gender, education level and employment" (p-value < 0.05). On the other hand there were no statistical significant association between hypothyroidism and the factors "marital status, type of family, smoking status, average family size, average monthly income and residency area" (p-value > 0.05).

Of medical chronic diseases risk factors; bivariate analysis showed that there were statistical significant positive association between hypothyroidism and the factors "DM, hypertension and goiter" (p-value < 0.05). On the other hand there was no statistical significant association with the factor "Presence of autoimmune diseases" (p > 0.05).

Among family history risk factors; bivariate analysis showed that there were statistically significant positive association between family history of thyroid disease, number of affected family members by thyroid disease and hypothyroidism (p-value <

0.05). While there were no statistical significant association between hypothyroidism and the factors "family history of diabetes mellitus, family history of hypertension " (p-value > 0.05).

For iatrogenic risk factors, bivariate analysis showed that there were statistically significant positive associations between hypothyroidism and drug related factor " anti-acids and iron intake" (p-value < 0.05) but there were no statistical significant association between hypothyroidism and the drug factors " minipills, combined pills and propranolol " (p-value > 0.05). Also, the analysis showed that there were positive relationship between "total and partial thyroidectomy and exposure to radioactive iodine" and hypothyroidism.

Among reproductive risk factors, bivariate analysis showed that there was statistically significant positive associations between hypothyroidism and the factor " postpartum thyroiditis" (p-value < 0.05). On the other hand there were no statistical significant association between hypothyroidism and the factors "parity, gravidity, and abortion" (p-value > 0.05).

Among diet risk factors; bivariate analysis showed that there were a statistically significant negative association between hypothyroidism and diet factors "milk intake three times and more weekly, peanuts intake 1-2 times and less than once weekly, pineapple intake 1-2 times and less than once weekly, raisin intake 1-2 times and less once than weekly, sesame intake 1-2 times and walnuts intake" (p-value < 0.05). While, there were no statistically significant association between hypothyroidism and the factors "lettuce, spinach, green pepper, cauliflower and cabbage intake"(p-value > 0.05).

5.2 Recommendations

1. Improvement and enhancement of a systematic hypothyroidism surveillance and documentation at all levels of heath care system in Gaza Strip and generate a national data base regarding hypothyroidism.

2. Supporting epidemiological studies in the area of hypothyroidism and encouraging further studies to tackle new emerging risk factors for hypothyroidism .

3. Adopting health education program to increase awareness on hypothyroidism as one of the common endocrine disorders, to work on modifiable risk factors for hypothyroidism .

4. Creating hypothyroidism screening program for female diabetic and/or hypertensive patients aged 40 years and above.

5. People with goiter, positive family history of hypothyroidism should be regularly screened for hypothyroidism as they are at higher risk to have hypothyroidism.

6. Women with postpartum thyroiditis should be screened regularly for hypothyroidism as they are at higher risk to have hypothyroidism.

7. Enhancing rational use of drug as some drugs might be accused for hypothyroidism.

5.3 Recommended further research

1. Conducting studies to identify the prevalence of hypothyroidism among Palestine population.

2. Conducting population based biochemical survey to correlate TSH,T4,T3 anti- TPO and mid-urinary iodine. In addition to tracking subclinical hypothyroidism.

3. Conducting more in-depth studies to investigate the effect of national dietary pattern on hypothyroidism development.

4. Conducting studies to explore and investigate relationship between hypothyroidism and autoimmune diseases.

5. Conducting studies regarding hypothyroidism among special categories as pregnant women, diabetic and for children.

6. Conducting studies to explore the synergetic effect of diet and lifestyle on thyroid function in Gaza strip.

7. Supporting and conducting studies regarding the effect of co-morbidities on hypothyroidism like DM, anemia and other chronic diseases.

8. Conducting more studies to explore the possible short and long term complications of hypothyroidism.

References:

Abdeen, H. (2006). Chronic Diseases in Palestine: The Rising Tide. *Israeli-Palestinian Public Health Magazine (Bridges), 3*.

Aich, R. K., Deb, A. R., Pal, S., Naha, B. L., & Ray, A. (2005). Iatrogenic hypothyroidism: A consequence of external beam radiotherapy to the head & neck malignancies. *Journal of cancer research and theraputics*, pp. 142-146.

Akamizu , T., Amino , N., & De Groot , L. (2008). *Hashimoto's Thyroiditis* . Retrieved 2016, from www.thyroidmanager.org.

Akyurek, S., Babalioglu, I., Kose, K., & Gokce, S. C. (2014). Thyroid Dysfunction Following Supraclavicular Irradiation in the Management of Carcinoma of the Breast. *International Journal of Hematology and Oncology*, pp. 139-144.

Al-Geffari, M., Ahmad, N. A., Al-Sharqawi,, A. H., Youssef, A. M., AlNaqeb, D., & Al-Rubeaan, K. (2013). Risk Factors for Thyroid Dysfunction among Type 2 Diabetic Patients in a Highly Diabetes Mellitus Prevalent Society. *International Journal of Endocrinology*.

Alkafajei, A., Amarin, Z., Alazaizeh, W., Khader, Y., & Marji, M. (2012). Prevalence and risk factors for hypothyroidism in Jordanian women: comparison between different reference ranges. *Eastern Mediterranean Health Journal*, pp. 132-136.

Almandoz, J. P., & Gharib, H. (2012). Hypothyroidism:Etiology, Diagnosis,and Management. *Medical Clinics of North America*, pp. 203-221.

Al-Shalhoub, A. K., & Al-Dhahri, S. (2017). Risk Factors of Post-Hemithyroidectomy Hypothyroidism. *Saudi Journal of Medicine & Medical Sciences*, pp. 45-48.

Al-shanti, T., & Yassin, M. (2017). Pesticides impact on testicular and thyroid functions of farm workers in Gaza Strip. *ANNALS OF BRITISH MEDICAL SCIENCES*, pp. 3-9.

Al-Sumry, S., Al-Ghelani, T., Al-Bad, H., Al-Azri, M., & Elshafie, K. (2015). Thyroid Diseases in Omani Type 2 Diabetics: A Retrospective Cross-Sectional Study. *Advances in Endocrinology*.

American Thyroid Association (2014), retrived from American thyroid association on 9 2018.

Aminorroaya, A., Meamar, R., Amini, M., Feizi, A., Tabatabae, A., & Imani, E. F. (2017). Incidence of thyroid dysfunction in an Iranian adult population: the predictor role of thyroid autoantibodies: results from a prospective population-based cohort study. *European Journal of Medical Research*.

Amouzegar, A., Heidari, M., Gharibzadeh, S., & Azizi, F. (2015). The Association Between Blood Pressure and Normal Range Thyroid Function Tests in a Population Based Tehran Thyroid Study. *Hormone and Metabolic Research*, pp. 151-156.

Amro, N. R., Halahleh, A., Abu Znaid, I., & Masalma, A. (2017, December). General Assessment of Thyroid Stimulating Hormone (TSH) Levels Among People Livingin South of Hebron, Palestine. *International Journal of Information Research and Review*, pp. 4934-4937.

Andersen, S. L., Olsen, J., & Laurberg, P. (2016). Maternal thyroid disease in the Danish National Birth Cohort: prevalence and risk factors. *European Society of Endocrinology*, pp. 203-212.

Asvold , B., Bjøro , T., Nilsen, T., & Vatten , L. (2007). Association between blood pressure and serum thyroid-stimulating hormone concentration within the reference range: a population-based study. *Journal of clinical endocrinology and metabolism* , pp. 841-845.

Bagcchi, S. (2013). Hypothyroidism is still prevalent in India despite promotion of iodised salt, study shows. *The BMJ Journal*.

Bajaj, J. K., Salwan, P., & Shalini , S. (2016-A). Various Possible Toxicants Involved in Thyroid Dysfunction: A Review. *Journal of Clinical and Diagnostic Research*.

Bajaj, S., Purwar, N., Gupta, A., Gupta, P., & Srivastava, A. (2016-B). Prevalence of hypothyroidism in diabetic kidney disease and effect of thyroid hormone replacement on estimate glomerular filtration rate. *Indian Journal of Endocrinology and Metabolism*, pp. 795-798.

Bello, F., & Bakari, A. G. (2012). Hypothyroidism in adults: A review and recent advances in management. *Journal of Diabetes and Endocrinology*, pp. 57-69.

Bensenor, I. M., Olmos, R. D., & Lotufo, P. A. (2012). Hypothyroidism in the elderly: diagnosis and management. *Clinical Intervention*, pp. 97-111.

Bivolarski , A., Gatseva , P., & Maneva, A. (2013). Association Between Thyroid and Iron Status of Pregnant Women in Southern Bulgaria. *Journal of Endocrinology and Diabetes Mellitus*, pp. 15-21.

Bjoro , T., Holmen , J., Krüger , O., Midthjell , K., Hunstad , K., Schreiner , T., et al. (2000). Prevalence of thyroid disease, thyroid dysfunction and thyroid peroxidase antibodies in a large, unselected population. The Health Study of Nord-Trondelag (HUNT). *European Journal of Endocrinology*, pp. 639-647.

Bjøro, T., Nilsen, T. I., Vatten, L. J., & Asvold, B. O. (2007). Tobacco Smoking and Thyroid Function: A Population-Based Study. *Archives of Internal Medicine*, pp. 1428-1232.

Bogado, J. L., Silva Souza1, F. G., & Dedivitis, R. A. (2017). Hypothyroidism after Hemithyroidectomy. *Clinics In Surgery*.

Bolk, N., Visser, T. J., Tijssen, J. G., & Berghout, A. (2015). Quality of life in patients with primary hypothyroidism related to BMI. *European Journal of Endocrinology*.

Butler, N. (2018, 1). *https://www.healthline.com/health/selenium-foods*. Retrieved September 16, 2018, from healthline.

Canaris , G., Manowitz , N., Mayor , G., & Ridgway , E. (2000). The Colorado thyroid disease prevalence study. *Archives of internal medicine*, pp. 526-534.

Canaris, G. J., Tape, T. G., & Wigton, R. S. (2013). Thyroid disease awareness is associated with high rates of identifying subjects with previously undiagnosed thyroid dysfunction. *BMC Public Health*.

Chaker, L., Bianco, A. C., Jonklaas, J., & Peeters, R. P. (2017, September 23). Hypothyroidism. *The Lancet*, pp. 1550-1562.

Chen, T.-Y., Hsu, C.-C., Feng, I.-J., Wang, J.-J., Su, S.-B., Guo, H.-R., et al. (2017). Higher risk for thyroid diseases in physicians than in the general population: a Taiwan nationwide population-based secondary analysis study. *An International Journal of Medicine*, pp. 163-168.

Cheserek, M. J., Wu, G., Shen, L., Shi, Y., & Le, G. (2014). Evaluation of The Relation Between Subclinical Hypothyroidism and Metabolic Syndrome Compnents Among Workers. *International Journal of Occupational Medicine and Environmental Health*, pp. 175-187.

Deepika, G., Veeraiah, N., Rao, P., & Reddy, N. (2015). Prevalence of hypothyroidism in Liver Cirrhosis among Indian patients. *International Journal of Pharmaceutical and Medical Research*, pp. 4-7.

Dietitians of Canada. (2018). *Food Sources of Iodine*. Retrieved 10 2, 2018, from https://www.dietitians.ca/Downloads/Factsheets/Food-Sources-of-Iodine.aspx..

Díez, J. J., & Iglesias, P. (2004). Spontaneous Subclinical Hypothyroidism in Patients Older than 55 Years: An Analysis of Natural Course and Risk Factors for the Development of Overt Thyroid Failure. *The Journal of clinical endocrinology and metabolism*, pp. 4890-4897.

Drum, R. (2010). *Thyroid Function and Dysfunction*. Retrieved 09 29, 2018, from https://www.slideshare.net/roger961/thyroid-function-and-dysfunction-pdf-file.

Drutel , A., Archambeaud, F., & Caron, P. (2013). Selenium and the thyroid gland: more good news for clinicians. *clinical Endocrinology (Oxford).*, pp. 155-164.

Duntas , L. (2008). Environmental factors and autoimmune thyroiditis. *Nature Clinical Practice Endocrinology and Metabolism*, pp. 454-460.

Duntas, L., & Stathatos , N. (2015). Toxic chemicals and thyroid function: hard facts and lateral thinking. *Reviews in Endocrine and Metabolic Disorders*, pp. 311-318.

Effraimidis, G., Strieder, T. G., Tijssen, J. G., & Wiersinga, W. M. (2011). Natural history of the transition from euthyroidism to overt autoimmune hypo- or hyperthyroidism: a prospective study. *European Journal of Endocrinology*, pp. 107-113.

Eftekhari , M., Eshraghian , M., Mozaffari-Khosravi , H., Saadat , N., & Shidfar , F. (2007). Effect of iron repletion and correction of iron deficiency on thyroid function in iron-deficient Iranian adolescent girls. *Pakistan Journal of biology science* , pp. 255-260.

Elattar, E. A., Younes, T. B., & Mobasher, S. A. (2014). Hypothyroidism in patients with rheumatoid arthritis and its relation to disease activity. *Egyptian rehumatology and rehabilitation*, pp. 58-65.

Elebrashy, I. N., El Meligi, A., Laila Rashed, Rashed, L., Salam, R. F., Youssef, E., et al. (2016). Thyroid dysfunction among type 2 diabetic female Egyptian subjects. *Therapeutics and Clinical Risk Management*, pp. 1757—1762.

El-hadidi, k. T., Mansour, m. A., Elwakd, M., & El-Emary, A. (2014). Thyroid dysfunction and anti-thyroid antibodies in Egyptian patients with systemic lupus erythematosus: Correlation with clinical musculoskeletal manifestations. *Egyptian Rheumatologist, 36*(4).

Esposito, T., Lobaccaro, J. M., Esposito, M. G., Monda, V., Messina, A., Paolisso, G., ... & Messina, G. (2016). Effects of low-carbohydrate diet therapy in overweight subjects with autoimmune thyroiditis: possible synergism with ChREBP. *Drug design, development and therapy*, 10, 2939

Ezzeddine, D., Hamadi, C., Abbas, H. A., Nassar, A., Abiad, M., et al. (2017). Prevalence and Correlation of Hypothyroidism With Pregnancy Outcomes Among Lebanese Women. *Journal of the Endocrine society*, pp. 415-422.

Fan, C.-Y., Lin, C.-S., Chao, H.-L., Huang, W.-Y., Su, Y.-F., Lin, K.-T., et al. (2017). Risk of hypothyroidism among patients with nasopharyngeal carcinoma treated with radiation therapy: A Population-Based Cohort Study. *Radiotherapy and Oncology*, pp. 394-400.

Fernando, R. (2017). Myths and fallacies in thyroid disease. *The Ceylon Medical Journal*.

Fisher, J., Tran, T., Biggs, B., Tran, T., Dwyer, T., Casey, G., et al. (2011). Iodine status in late pregnancy and psychosocial determinants of iodized salt use in rural northern Viet Nam. *Bulletin of the World Health Organization*, pp. 813-820.

Friedrich , N., Schwarz, S., Thonack, J., John, U., Wallaschofski, H., & Völzke, H. (2008). Association between parity and autoimmune thyroiditis in a general female population. *Journal of Autoimmunity*, pp. 174-180.

Fujiwara , M., Kamikonya, N., Odawara, S., Suzuki, H., Niwa, Y., & Takada, Y. (2015). The threshold of hypothyroidism after radiation therapy for head and neck cancer: a retrospective analysis of 116 cases. . *Journal of radiation research*, pp. 577-582.

Gaitonde , D., Rowley , K., & Sweeney , L. (2012). Hypothyroidism: an update. *South Africa Family Practice*, pp. 384-390.

Garber, J. R., Cobin, R. H., Gharib, H., Hennessey, J. V., Klein, I., Mechanick, M. I., et al. (2012). Clinical Practice Guidelines for Hypothyroidism in Adults: Cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. *Thyroid Journal*, pp. 988-1028.

Ghawil , M., Tonutti , E., Abusrewil , S., Visentini, D., Hadeed , I., Miotti , V., et al. (2011). Autoimmune thyroid disease in Libyan children and young adults with type 1 diabetes mellitus. *European Journal of Paediatrics*, pp. 983-987.

Gibbons, V. A. (2011). *The Epigimology and Managment of Hypothyroidism in General Practice*. Retrieved 09 22, 2018, from http://researchspace.auckland.ac.nz.

Goldner, W. S., Sandler, D. P., Yu, F., Hoppin, J. A., Kamel, F., & Levan, T. D. (2010). Pesticide use and thyroid disease among women in the Agricultural Health Study. *American Journal of Epidemiology*, pp. 455-464.

Granfors, M. (2015). *Uppsala. Hypothyroidism and Pregnancy (PhD dissertation)*. Retrieved 09 22, 2018, from http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-247090.

Gurevitz, S. L., Snyder, J. A., Peterson, K. L., & Kelly, K. L. (2011, September). Hypothyroidism and Subclinical Hypothyroidism in the Older Patient. *The Consultant Pharmacist* , pp. 657-664.

Harris, C. (2014). Thyroid Disease and Diet — Nutrition Plays a Part in Maintaining Thyroid Health. *Today's Deititian*.

Hassen, A. F., & Ahmed, S. A. (2016, July-August). Assessment of Risk Factors related to Hypothyroidism for adults Patient at Bagdad Teaching Hopsitals. *IOSR Journal of Nursing and Health Science*, pp. 28-32.

He, W., An, X., Li, L., Shao, X., Li, Q., Yao, Q., et al. (2017). Relationship between Hypothyroidism and Non-Alcoholic Fatty Liver Disease: A Systematic Review and Meta-analysis. *Frontiers in Endocrinology*.

Huang, H.-K., Wang, J.-H., & Kao, S.-L. (2018). Association of Hypothyroidism With All-Cause Mortality: A Cohort Study in an Older Adult Population. *The Journal of Clinical Endocrinology & Metabolism*, pp. 3310-3318.

Iatrogenic Hypothyroidism. (n.d.) *Medical Dictionary*. (2009). Retrieved October 16 2018 from https://medical-dictionary.thefreedictionary.com/iatrogenic+hypothyroidism

Iglesias, P., & Diez, J. (2009). Thyroid dysfunction and kidney disease. *European Journal of Endocrinology*, pp. 503-515.

Institute of Medicine Food and Nutrition Board. (2001). *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc.* Washington: National Academies Press.

Iqbal, A., Figenschau, Y., & Jorde, R. (2006). Blood pressure in relation to serum thyrotropin: The Tromso study. *Journal of Human Hypertension*, pp. 933-936.

Kalra, S., Kumar, A., Jarhyan, P., & Unnikrishnan, A. G. (2015). Indices of thyroid epidemiology. *Indian Journal of Endocrinology and Metabolism*, pp. 844-847.

Khadem , N., Ayatollahi , H., Vahid Roodsari, F., Ayati, S., Dalili , E., Shahabian , M., et al. (2012). Comparison of serum levels of Tri-iodothyronine (T3), Thyroxine (T4), and Thyroid-Stimulating Hormone (TSH) in preeclampsia and normal pregnancy. *Iranian Journal of Reproductive Medicine*, pp. 47-52.

khan, A., & Majumder, I. (2010). Serum Creatinine and Uric Acid Levels of Hypothyroid Patients. *Bangladesh Journal of Medical Biochemistry*, p. 61 to 63.

Khatiwada, S., Rajendra, K., Santosh , K., Ahmed , S., Kumar , C. R., & Baral, N. (2015). Thyroid Dysfunction and Associated Risk Factors among Nepalese Diabetes Mellitus Patients . *International Journal of Endocrinology*.

Kibirige, D., Luzinda, K., & Ssekitoleko, R. (2013). Spectrum of lithium induced thyroid abnormalities: a current perspective. *Thyroid Research*.

Kim, D. (2016). Low vitamin D status is associated with hypothyroid Hashimoto thyroiditis. *hormones*.

Krishan , P., & Randhir, S. (2011). Clinical perspective of hypothyroidism. *Journal of Applied Pharmaceutical Science*, pp. 64-68.

Kumari, P., & Singh, S. (2018). Prevalence of overt and subclinical thyroid dysfunction among women and its effects on maternal and fetal outcome. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, pp. 2123-2128.

Kutluturk, F., Yildirim, B., Ozturk, B., Ozyurt, H., Bekar, U., Semsettin, s., et al. (2013). Thyroid dysfunctions and sonographic characteristics in northern Turkey: a population-based study. *Annals of Saudi Medicine*, pp. 253-259.

Lamfon, H. A. (2008). Thyroid Disorders in Makkah, Saudi Arabia. *Ozean Journal of Applied Science*.

Laurberg , P., Pedersen , K., Hreidarsson , A., Sigfusson , N., Iversen , E., & Knudsen , P. (1998). Iodine intake and the pattern of thyroid disorders:a comparative epidemiological study of thyroid abnormalities inthe elderly in Iceland and in Jutland, Denmark. *Journal of Clinical Endocrinology and Metabolism*, pp. 765-769.

Laurberg, P., Andersen, S., Pedersen, I. B., Knudsen, N., & Carl, A. (2013). Prevention of autoimmune hypothyroidism by modifying iodine intake and the use of tobacco and alcohol is manoeuvring between Scylla and Charybdis. *HORMONES* , pp. 30-38.

Lee , J., & Chung, W. Y. (2012). *Hypothyroidism After Hemithyroidectomy: Incidence, Risk Factors, Natural History and Management*. Retrieved 9 30, 2018, from www.intechopen.com.

Lerro, C. C., Freeman, L. E., DellaValle, C. T., Kibriya, M. G., Aschebrook-Kilfoy, B., Jasmine, F., et al. (2017). Occupational pesticide exposure and subclinical hypothyroidism among male pesticide applicators. *BMJ journal*.

Leung, A. M. (2017). first degree family members of patients with hypothyroidism due to Hashiomoto's thyroiditis are at nine fold increased risk of the same. *clinical endocrinology*, pp. 180-182.

Mackawy, A. M., Al-ayed, B. M., & Al-rashidi, B. M. (2013). Vitamin D Deficiency and Its Association with Thyroid Disease. *International Journal of Health Science*, pp. 267-275.

Madariaga,, A. G., Palacios, S. S., Guillén-Grima,, F., & Galofré, J. C. (2014). The Incidence and Prevalence of Thyroid Dysfunction in Europe: A Meta-Analysis. *Journal of clinical endocrinology and metabolism* , pp. 923-931.

Makandar, A., Sonagra, A. D., & Shafi, N. (2015). Study of thyroid function in type 2 diabetic and non-diabetic population. *International Journal of Medical Science and Public Health* , pp. 769-772.

Mazumdar, A., & Maji, D. (2008). Thyroid disease and pregnancy. *Thyroid Research and Practice*, pp. 6-10.

Metso, S. (2007). *Tampere university-long term prognosis for patients treated with radioactive iodine for hypaerthyroidism*. Retrieved 9 24, 2018, from http:/acta.uta.fi.

Mezzomo, T. R., & Nadal, J. (2016). Effect of nutrients and dietary substances on thyroid function and hypothyroidism. *FREE THEMED ARTICLES*, pp. 427-443.

MOH. (2014). *PALESTINIAN MICRONUTRIENT SURVEY (PMS) 2013.*

MOH. (2017). *Ministry of Health Gaza Strip*. Retrieved 9 23, 2018, from http://www.moh.gov.ps.

MOH. (2018). *Minstry of Health-Gaza Strip Hospitals* . Retrieved 9 23, 2018, from http://www.moh.gov.ps/mohStatL/mohStat.html.

Moon, S.-H., Lee, B.-J., Kim, S.-J., & Kim, H.-C. (2016). Relationship between thyroid stimulating hormone and night shift work. *Annals of occupational and environmental*.

Mosleh, M., Aljeesh, Y., & Dalal, K. (2016). Burden of Chronic Diseases in the Palestinian Healthcare Sector Using Disability-Adjusted Life Years (DALY), Palestine. *Diversity & Equality in Health and Care*, pp. 261-268.

Müller, B., Zulewski, H., Huber,, P., Ratcliffe, J. G., Jean-Jacques Staub, & Staub, J.-J. (1995). Impaired Action of Thyroid Hormone Associated with Smoking in Women with Hypothyroidism. *The New England Journal of Medcicne*, pp. 964-969.

Nanfang , L., Heizhati, M., Sun, C., Abulikemu, S., Shao, L., Yao, X., et al. (2016). Thyroid Stimulating Hormone Is Increased in Hypertensive Patients with Obstructive Sleep Apnea. *International Journal of Endocrinology*.

Narayana, S. K., Woods, D. R., & Boos, C. J. (2011). Management of Amiodarone-Related Thyroid Problems. *Therapeutics Advances in Endocrinology and Metabolism*, pp. 115-126.

Nouh, A. M., Eshnaf, I. A., & Basher, M. A. (2008). Prevalence of Thyroid Dysfunction and Its Effect on Serum Lipid Profiles in a Murzok, Libya Population. *Thyroid science*, pp. 1-6.

Olmos, R., de Figueiredo,, R., Aquino,, E., Lotufo, P., & Bensenor, I. (2015). Gender, race and socioeconomic influence on diagnosis and treatment of thyroid disorders in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). *Brazil Journal of Medical Biology Research*, pp. 751-758.

Palacios , C., & Gonzalez, L. (2014). Is vitamin D deficiency a major global public health problem? *Journal of Steroid Biochemistry and Molecular Biology*, pp. 138-145.

Park , Y. J., & Kim, Y. A. (2014). Prevalence and Risk Factors of Subclinical Thyroid Disease. *Endocrine and Metabolism*, pp. 20-29.

Park, W. R., Oh, T. K., & Jeon, H. J. (2013). Prospective Observation of 5-Year Clinical Course of Subclinical Hypothyroidism in Korean Population. *Journal of Korean Medical Science*, pp. 1622-1626.

PASSIA. (2008). *Palestinian Academic Society for the study of international Affairs*. Retrieved 9 20, 2018, from http://www.passia.org.

PCBS. (2017). *Palestinian Central Bureau of Statistics.* Retrieved 9 21, 2018, from http://www.pcbs.gov.org.

Pedersen, I. B., Laurberg, P., Knudsen, N., Jørgensen, T., Perrild, H., Ovesen, L., et al. (2007). An Increased Incidence of Overt Hypothyroidism after Iodine Fortification of Salt in Denmark: A Prospective Population Study. *The Journal of Clinical Endocrinology & Metabolism*, pp. 3122-3127.

Petersen , K., Lindstedt , G., Lundberg , P., Bengtsson , C., Lapidus , L., & Nyström , E. (1991). Thyroid disease in middle-aged and elderly Swedish women: thyroid-related hormones, thyroid dysfunction and goitre in relation to age and smoking. *Journl of International Medicine*, pp. 407-413.

Pontikides, N., & Krassas, G. E. (2002). Influence of cigarette smoking on thyroid function, goiter formation and autoimmune thyroid disorders. *Hormones*, pp. 91-98.

Radi, R. A., & Shubair, M. E. (2010). Assessment of Thyroid Function in Pregnant Women From Rimal Health Center, Gaza City.

Roberts, C. G., & Ladenson, P. W. (2004). Hypothyroidism. *THE LANCET*, pp. 793-803.

Roberts, H. L. (2017). *Walnuts and the Thyroid*. Retrieved 10 2, 2018, from https://www.livestrong.com/article/556115-walnuts-and-the-thyroid/.

Salau, B. A., Ajani, E. O., Soladoye, M. O., & Nurudeen A, B. (2011). Evaluation of iodine content of some selected fruits and vegetables in Nigeria. *African Journal of Biotechnology*, pp. 960-964.

Sawin, C. T., Castelli, W. P., Hershman, J. M., McNamara, P., & Bacharach, P. (1985). The aging thyroid: thyroid deficiency in the Framingham study. Archives of internal medicine, 145(8), 1386-1388

Sethi, B., Barua, S., Raghavendra, M., Gotur, J., Khandelwal, D., & Vyas, U. (2017). The Thyroid Registry: Clinical and Hormonal Characteristics of Adult Indian Patients with Hypothyroidism. *Indian Journal of Endocrinology and Metabolism*, pp. 302-307.

Sharma, R., Bharti, S., & Hari Kumar, K. (2014). Diet and thyroid - myths and facts. *Journal of Medical Nutriton and Nutraceticals*(3), pp. 60-65.

Shivaprasad, C., Rakesh, B., Anish, K., Annie, P., Amit, G., & Dwarakanath, C. (2018). Impairment of Health-related Quality of Life among Indian Patients with Hypothyroidism. *Indian Journal of Endocrinology and Metabolism*, pp. 335-338.

Sinha, U., Sinharay, K., Saha, S., Longkumer, T., Baul, S. N., & Pal, S. K. (2013). Thyroid disorders in polycystic ovarian syndrome subjects: A tertiary hospital based cross-sectional study from Eastern India. *Indian Journal of Endocrinology and Metabolism*, pp. 304-309.

So, M., MacIsaac , R. J., & Grossmann , M. (2014). Hypothyroidism Investigation and management. *Australian Family Physician*, pp. 556-562.

Stegall, L. P., Holladay, M. C., Abdelrehiem, A. M., & Olin, B. R. (2014). Hypothyroidism:Overview and Treatment options. *Alabama Pharmacy Association*, pp. 1-8.

Strieder , T., Prummel, M., Tijssen , J., Endert , E., & Wiersinga, W. (2003). Risk factors for and prevalence of thyroid disorders in a cross-sectional study among healthy female relatives of patients with autoimmune thyroid disease. *Clinical Endocrinology (Oxford)*, pp. 396-401.

Sultan, S., & Rashed, L. (2009). Effect of Low Calorie Diet and Exercise on Thyroid Hormones and Leptin Levels . *medical journal of cairo university*, pp. 33-39.

Surks, M., Ortiz, E., & Daniels, G. (2004). Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. *JAMA*, pp. 228-238.

Thyroid UK. (2017). *Foods That Can Cause Problems*. Retrieved 09 29, 2018, from http://www.thyroiduk.org.uk/tuk/treatment/foods.html.

Tonstad , S., Nathan, E., Oda , K., & Fraser, G. (2013). Vegan Diets and Hypothyroidism. *nutrients*, pp. 4642-4652.

Tunde-Akintunde, T., Oke, M., & Akintunde, B. (2012). *Sesame Seed*. Retrieved 10 2, 2018, from www.intechopen.com.

Unnikrishnan, A. G., Kalra, S., Sahay, R. K., Bantwal, G., John, M., & Tewari, N. (2013). Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. *Indian Journal of Endocrinology and Metabolism*, pp. 647-652.

Vaidya, B., & Pearce, S. H. (2008). Management of hypothyroidism in adults. *British Medical Journal*, pp. 284-289.

Vanderpump , M., Tunbridge , W., French , J., Appleton , D., Bates , D., & Clark , F. (1995). The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham Survey. *clinical endocrinology*, pp. 55-68.

Vanderpump, M. P. (2011). The epidemiology of thyroid disease. *British Medical Bulletin*, pp. 39-51.

Vanderpump, M. P., & Tunbridge, W. G. (2002). Epidemiology and prevention of clinical and subclinical hypothyroidism . *Thyroid*, pp. 839-847.

Ventura, A., Neri, E., Ughi, C., & Leopaldi, A. C. (2000). Gluten-dependent diabetes-related and thyroid-related autoantibodies in patients with celiac disease. *Journal of Pediatrics*, pp. 263-265.

Ventura, M., Melo, M., & Carrilho , F. (2017). Selenium and Thyroid Disease: From Pathophysiology to Treatment. *International Journal of Endocrinology*.

Verloop, H., Louwerens, M., Schoones, J. W., Kievit, J., Smit, J. W., & Dekkers, O. M. (2012). Risk of Hypothyroidism following Hemithyroidectomy: Systematic Review and Meta-Analysis of Prognostic Studies. *Journal of Clinical Endocrinology Metabolism*, pp. 2243–2255.

Vogelius, I. R., Bentzen, S. M., Maraldo, M. V., Petersen, P. M., & Specht, L. (2011). Risk Factors for Radiation-Induced Hypothyroidism. *Cancer*, pp. 5250-5260.

Waegeneers, N., Thiry, C., De Temmerman , L., & Ruttens, A. (2013). Predicted dietary intake of selenium by the general adult population in Belgium. *Food Addit Contam Part A Chem Anal Control Expo Risk Assess.*

Walsh JP, J., Bremner , A., Feddema , P., Leedman , P., Brown , S., & O'Leary , P. (2010). Thyrotropin and thyroid antibodies as predictors of hypothyroidism: a 13-year, longitudinal study of a community-based cohort using current immunoassay techniques. *Journal of Clinical Endocrinology and Metabolism.*, pp. 1095-1104.

Warren, J. (2017). *High Protein Diet & Thyroid*. Retrieved 09 30, 2018, from https://www.livestrong.com/article/477979-is-syntha-6-good-for-weight-loss/.

Wass J. A. , &Stewart, P. (2011). *Oxford Textbook of Endocrinology and Diabetes.* oxford University Press.

WHO EMRO. (2012). *The work of WHO in the Eastern Mediterranean Region:Annual report of the Regional Director 1*. Retrieved 10 4, 2018, from http://www.emro.who.int/annual-report/2012/index.html.

Wiersinga, W. (2013). Smoking and thyroid. *Clinical Endocrinology (Oxford)*, pp. 145-151.

Wormald , R., Sheahan , P., Rowley , S., Rizkalla, H., & toner, C. (2008). Hemithyroidectomy for benign thyroid disease: who needs follow-up for hypothyroidism. *clinical otolaryngyology*, pp. 587-591.

Zimmermann, M. B. (2009). Iodine Deficiency. *Endocrine Reviews*, pp. 376–408.

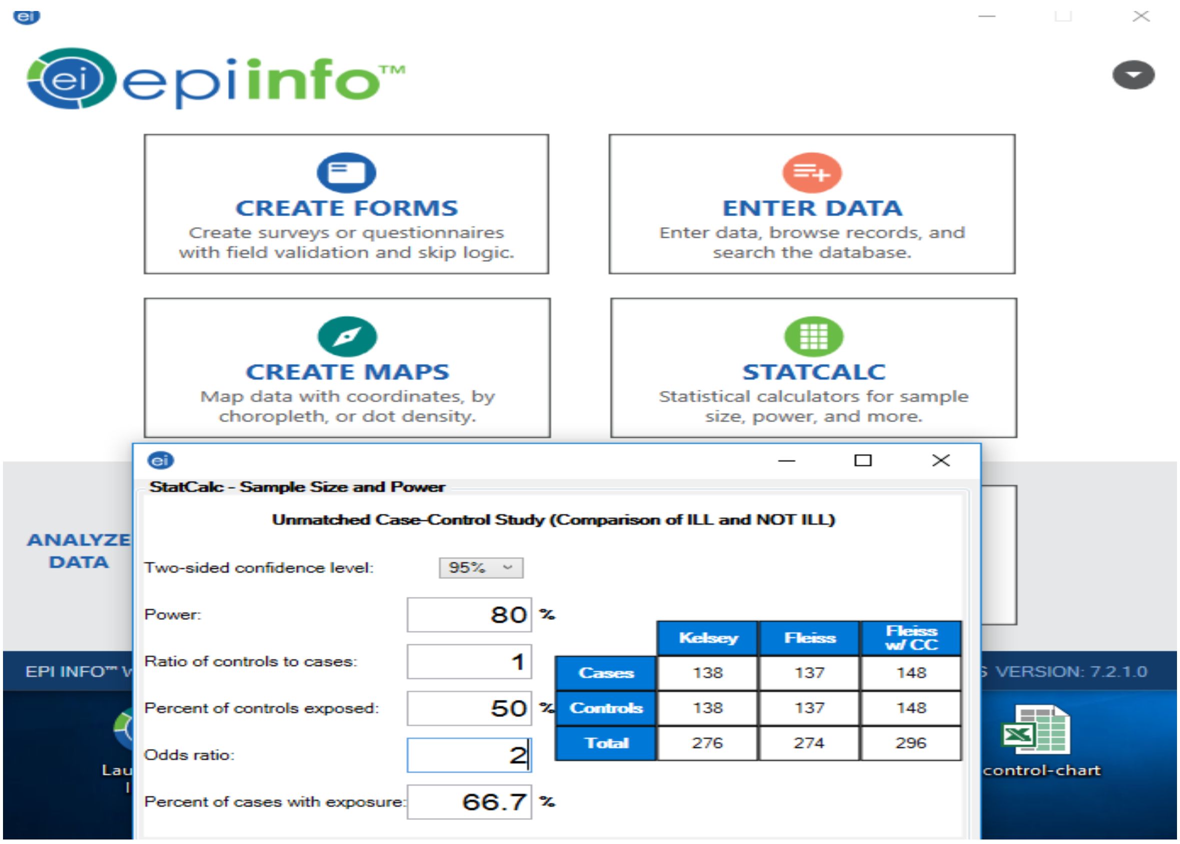
Zimmermann, M. B., & Boelaert, K. (2015). Iodine deficiency and thyroid disorders. *Lancet Diabetes and Endocrinology*, pp. 286-295.

Annexes

Annex (1): Palestine map

Source: Palestine Central Bureau of statistics (2017)

Annex(2): Sample size calculation



Annex (3): Helsinki Approval

المجلس الفلسطيني للبحث الصحي

Palestinian Health Research Council

تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار

Developing the Palestinian health system through institutionalizing the use of information in decision making

Helsinki Committee

For Ethical Approval

Date: 01/08/2016

Number: PHRC/HC/137/16

Name: KHALIL I. HAMAD

الاسم: خليل حماد

We would like to inform you that the committee had discussed the proposal of your study about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Risk factors of hypothyroidism among Palestinian refugees in Gaza strip

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/137/16 in its meeting on 01/08/2016

و قد قررت الموافقة على البحث المذكور عاليه بالرقم و التاريخ المذكوران عاليه.

Signature

Member

Member

Chairman

Genral Conditions:-

1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed.

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine

غزة - فلسطين

شارع النصر - مفترق العيون

Annex(4): Managerial approval

State of Palestine
Ministry of health

دولة فلسطين
وزارة الصحة

التاريخ:28/02/2018
رقم المراسلة 197762

السيد : رامي عيد سليمان العبادله المحترم

مدير عام بالوزارة /الإدارة العامة لتنمية القوى البشرية - /وزارة الصحة

السلام عليكم ,,,

الموضوع/ تسهيل مهمة الباحث/ خليل حمد

التفاصيل // بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحث/ خليل إبراهيم حمد الملتحق ببرنامج ماجستير الصحة العامة – مسار علم الأوبئة - جامعة القدس أبوديس في إجراء بحث بعنوان "Risk Factors of Hypothyroidism in the Gaza Strip: Case control study" -: حيث الباحث بحاجة للاطلاع على الملف الطبي وتعبئة استبانة من عدد من مرضى قصور الغدة الدرقية المراجعين لمستشفيات مراكز الرعاية الأولية في قطاع غزة (مجمع الشفاء الطبي –مستشفى شهداء الأقصى –مجمع ناصر الطبي- مستشفى غزة الأوربي- مركز صحي شهداء الرمال –مركز صحي دير البلح- بندر خانيونس) وعينة ضابطه لا تعاني من هذه المشكلة. نأمل توجيهاتكم لذوي الاختصاص بضرورة الحصول على الموافقة المستنيرة من المرضى وغيرهم الذين هم على استعداد للمشاركة في البحث ومن ثم تمكين الباحث من التواصل معهم، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسئولية. وتفضلوا بقبول التحية والتقدير، ملاحظة / تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 5 أشهر من تاريخه.

محمد ابراهيم محمد السرساوي
مدير دائرة/الإدارة العامة لتنمية القوى البشرية -

التحويلات

محمد ابراهيم محمد السرساوي(مدير دائرة)	← رامي عيد سليمان العبادله(مدير عام بالوزارة)	إجراءاتكم بالخصوص(28/02/2018)
رامي عيد سليمان العبادله(مدير عام بالوزارة)	← عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	إجراءاتكم بالخصوص(28/02/2018)
رامي عيد سليمان العبادله(مدير عام بالوزارة)	← ماهر محمود عبدالهادي شامية(مدير عام بالوزارة)	إجراءاتكم بالخصوص(28/02/2018)
عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← مدحت عباس خضر حسن (مدير عام بالوزارة)	إجراءاتكم بالخصوص(28/02/2018)
عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← محمد خليل محمد زقوت(مدير)	إجراءاتكم بالخصوص(28/02/2018)
عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← كمال عواد محمد خطاب(مدير مستشفى)	إجراءاتكم بالخصوص(28/02/2018)
محمد خليل محمد زقوت(مدير)	← ايمن خالد عثمان الفرا(طبيب مقيم)	لعمل اللازم(28/02/2018)
محمد خليل محمد زقوت(مدير)	← علاء الدين محمود فايز المصري(طبيب رئيس قسم)	لعمل اللازم(28/02/2018)
مدحت عباس خضر حسن (مدير عام بالوزارة)	← حسن محمد خليل حافظ اللوح(مدير مستشفى)	إجراءاتكم بالخصوص(28/02/2018)
مدحت عباس خضر حسن (مدير عام بالوزارة)	← رافت حامد يوسف حمدونه(مدير دائرة)	إجراءاتكم بالخصوص(28/02/2018)
مدحت عباس خضر حسن (مدير عام بالوزارة)	← زهير محمود احمد نوفل(مدير دائرة التمريض)	إجراءاتكم بالخصوص(28/02/2018)
حسن محمد خليل حافظ اللوح(مدير مستشفى)	← محمد عبدالرحيم احمد زقوت(طبيب رئيس قسم)	إجراءاتكم بالخصوص(28/02/2018)

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Annex (5): Consent form

استبانة

Risk Factors of Hypothyroidism among Palestinian In Gaza Strip: Case Control Study

الأخ الفاضل /الأخت الفاضلة:

السلام عليكم ورحمة الله وبركاته، وبعد ...

أنا الطالب خليل إبراهيم حمد طالب في جامعة القدس ماجستير الصحة العامة تخصص علم الأوبئة أقوم بإجراء دراسة عن – عوامل الخطر التي تؤدي إلى حدوث كسل الغدة الدرقية في قطاع غزة.

مشاركتك في هذه الدراسة ستساعد الطالب على معرفة عوامل الخطر التي تؤدي إلى حدوث كسل الغدة الدرقية، وبالتالي رفع التوصيات للتعامل معها للحد منها قدر الامكان .

مشاركتك في هذه الدراسة لا تشكل خطرًا أو تكلفة مادية عليك والمعلومات المستمدة من هذه الدراسة سوف تستخدم فقط لغرض البحث، ولن تستخدم لأغراض أخرى، وسوف تعامل بطريقة سرية.

عدد المشاركين في الدراسة300 مشارك، وقد تم اختيارك للمشاركة بطريقة عشوائية . أرجو منك المشاركة في هذه الدراسة .

في حال الموافقة، سوف نقوم بمقابلة تستغرق 15 دقيقة من وقتك ونعلمك أنه يمكن عدم الإجابة عن بعض الأسئلة أو التوقف عن الإجابة متى شئت . إذا كان لديك أي استفسار يمكن أن تستوقفني وتطلب الشرح اللازم.

مع جزيل الشكر والتقدير

د. خليل إبراهيم حمد

Annex (6): Questionnaire

كليـــة الصحـــــة العامـــــة

1.المعلومات العامة (المعلومات الشخصية الديموغرافية)

1-1 الرقم التسلسلي: ☐ ☐ ☐ ☐

2-1 تاريخ المقابلة:............................

3-1 فئة البحث: ☐ حالة ☐ ضابط

4-1 تاريخ الميلاد:...............................

5-1 رقم الجوال:.....................................

6-1 الجنس: ☐ ذكر ☐ أنثى

7-1 الحالة الزوجية: ☐ أعزب ☐ متزوج ☐ منفصل ☐ أرمـــل

8-1 المحافظة: ☐ الشمال غزة ☐ غزة ☐ دير البلح ☐ خانيونس ☐ رفح

9-1 مكان السكن: ☐ مدينة ☐ قرية ☐ مخيم

10-1 الأسرة :

1-10-1 كم عدد أفراد الأسرة؟.......................

2-10-1 هل الأسرة؟ ☐ ممتدة ☐ نووية

11-1 المستوى التعليمي: ☐ غير متعلم ☐ يقرأ ويكتب ☐ ابتدائي ☐ إعدادي
☐ ثانوية ☐ دبلوم ☐ بكالوريوس فما فوق

12-1 العمل:

1-12-1 هل تعمل حالياً/ سابقا؟ ☐ نعم ما هي وظيفتك؟......................
☐ إذن، انتقل إلى فقرة رقم (13)

2-12-1 هل تعرضت خلال عملك إلى

أ- المبيدات الحشرية؟ ☐ نعم فترة الاستخدام من................إلى................
☐ لا

ب- الأشعة السينية ☐ نعم مدة العمل في مجال التصوير بالأشعة من............إلى.............
☐ لا

3-12-1 هل عملت في مجال صناعة الأنسجة؟
☐ نعم مدة العمل في صناعة الانسجة من ....إلى..........
☐ لا

13-1 الدخل الشهري:
كم دخل الأسرة الشهري بالشيكل؟.....................

14-1 التدخين :
1-14-1 هل تدخن؟
☐ غير مدخن ☐ مدخن سابق ☐ مدخن سلبي ☐ مدخن

2-14-1 إذا كنت مدخن: ☐ سجائر كم سيجارة تدخن يومياً؟.......................
☐ الأرجيلة كم مرة يومياً؟...................
كم مرة شهرياً؟........................

2.التاريـــخ الطبـــي الأســري

(أفراد الأسرة يقصد بهم: الأم ، الأب ، الأخ، الأخت، الابن ، الابنه)

2-1هل يوجد أحد من أفراد الأسرة مصاب بأمراض ارتفاع الضغط ؟

☐ نعم ☐ لا

2-2 هل يوجد أحد من أفراد الأسرة مصاب بأمراض السكر؟

☐ نعم ☐ لا

2-4 هل يوجد أحد من أفراد الأسرة مصاب بأمراض مزمنة عدا ارتفاع الضغط والسكر ؟

☐ نعم ☐ لا

إذا كانت الإجابة نعم، حدد المرض إن أمكن:..

2-5 هل يوجد أحد من أفراد الأسرة مصاب بأمراض مناعيه ؟

☐ نعم ☐ لا

الرقم	المرض	نعم	لا
1	مرض السيلياك (حساسية الجلوتين)		
2	الذئبة الحمراء		
3	مرض السكري النوع الأول		
4	الصدفية		
5	روماتيزم المفاصل		
6	أخرى الرجاء التحديد.........		

2-3 هل يوجد أحد من أفراد الأسرة مصاب بأمراض الغدة الدرقية تم تشخيصها؟

☐ نعم ☐ لا

إذا كانت الإجابة نعم، حدد المرض إن أمكن:.................... عدد الاشخاص المصابين...................

3-التاريـــــخ الطبـــي للحالـــــة

3-1 الأمراض الباطنية

3-1-1 هل أنت مصاب بمرض نقص هرمونات الغدة الدرقية؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، فأجب عن الأسئلة التالية:

أ- في أي سنة تم تشخيص المرض؟ ....

ب- هل حصل أن أصبت بتضخم الغدة الدرقية؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، في أي سنة أصبت بتضخم الغدة الدرقية؟.....................

3-1-2 هل تعاني من مرض السكري؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، حدد نوع داء السكري: ☐ النوع الأول ☐النوع الثاني

3-1-3 هل تعاني من أمراض ارتفاع ضغط الدم؟ ☐نعم ☐ لا

3-1-4 هل تعاني من أي أمراض مزمنة غير السكري وارتفاع ضغط الدم؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، حدد نوع المرض..........................

3-1-5 هل تعاني من أي أمراض هرمونية باستثناء الغدة الدرقية؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، حدد نوع المرض..........................

3-1-6 هل أنت مصاب بأحد الأمراض المناعية ؟ ☐ نعم ☐ لا

الرقم	المرض	نعم	لا
1	مرض السيلياك (حساسية الجلوتين)		
2	الذئبة الحمراء		
3	الصدفية		
4	روماتيزم المفاصل		
5	أخرى الرجاء التحديد.........		

3-2 الحالة الجراحيـة

3-2-1 هل تم سحب عينة من الغدة الدرقية باستخدام الحقن؟ ☐ نعم ☐لا

3-2-2 هل سبق وأن خضعت لعملية جراحية خاصة بالغدة الدرقية؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، فأجب عن الأسئلة التالية:

أ- هل كان استئصال الغدة الدرقية: ☐جزئي ☐ كامل

ب- ما سبب استئصال الغدة الدرقية:

☐ تضخم في كامل الغدة الدرقية ☐ تضخم موضعي (في جزء من الغدة)

☐ورم سرطاني في الغدة الدرقية ☐ورم حميد في الغدة الدرقية ☐ زيادة نشاط الغدة الدرقية

ت- هل تم إرسال العينة إلى المختبربعد الاستئصال الجراحي؟ ☐نعم ☐لا

3-2-3 هل تعرضت لليود المشع؟ ☐ نعم ☐ لا

إذا كانت الاجابة نعم، فأجب عن الأسئلة التالية:

3-2-3-1هل كان لغرض التشخيص؟ ☐ نعم ☐ لا

3-2-3-2هل كان لغرض العلاج؟ ☐ نعم ☐ لا

إذا كانت الاجابة نعم، فأجب عن الأسئلة التالية:

أ - ما سبب العلاج باليود المشع؟ ☐ لعلاج زيادة نشاط الغدة الدرقية ☐لعلاج أورام الغدة الدرقية

ت- كم عدد جلسات العلاج باليود المشع؟

ث- هل خضعت لعملية جراحية للغدة الدرقية قبل العلاج باليود المشع؟

☐ نعم كم عدد الأشهر بين العملية والعلاج باليود المشع؟...................

☐ لا

ج- كم عدد الأشهر بين الانتهاء من العلاج باليود المشع و تشخيص خمول الغدة الدرقية؟................

3-2-4 هل تعرضت لعلاج إشعاعي (لغير أمراض الغدة الدرقية)؟ ☐ نعم ☐ لا

إذا كانت الإجابة نعم، فأجب عن الأسئلة التالية:

أ- ما سبب العلاج الإشعاعي؟ ☐ علاج أورام بالرأس ☐ علاج أورام بالعنق(باستثناء الغدة الدرقية)

☐علاج أورام بالصدر

ب- كم عدد جلسات الإشعاع؟ ....

ت- كم عدد الاشهر بعد تعرضك للإشعاع و تشخيص خمول الغدة الدرقية:..............

4-التاريـخ الإنجابي للسيدات المتزوجـات

1-4 عدد الحمولات؟.............

2-4 عدد الانجابات؟..................

3-4 عدد الاجهاضات؟..........................

2-4 هل حدث عندك التهاب في الغدة الدرقية بعد الولادة؟ ☐ نعم ☐ لا

3-4 هل أنجبت طفلاً في السنة التي سبقت تشخيص كسل الغدة الدرقية؟ ☐ نعم ☐ لا

5-العوامل المساهمة ذات العلاقة (الغذاء، الأدوية)

1-5 الغذاء

1-1-5 هل تتناول الملح المدعم باليود؟ ☐ نعم ☐ لا ☐ لا أعرف

2-1-5 الأغذية الحيوانية :

الرقم	الأغذية الحيوانية	يومياً	3-6 مرات أسبوعياً	1-2 مرة أسبوعياً	مرة كل أسبوعين	مرة شهرياً
1	اللحوم الحمراء					
2	اللحوم البيضاء (الدجاج ومشتقاته)					
3	الأسماك					
4	الحليب ومشتقاته					
5	لجبن					
6	الزبدة					

3-1-5 الأغذية النباتية:

الرقم	الأغذية النباتية	يومياً	3-6مرات أسبوعياً	1-2 مرة أسبوعياً	مرة كل أسبوعين	مرة شهرياً
1	الخس					
2	السبانخ					
3	الفلفل الأخضر					
4	الفول السوداني					
5	أناناس					
6	زبيب					
7	السمسم					
8	عين الجمل					
9	الزهرة					
10	الملفوف					

2-5 الأدوية

1-2-5 هل تتعاطى أحد الأدوية التالية؟

الرقم	الأدوية	لا أتناول	تاريخ بداية الاستعمال	المدة	الجرعة
1	مضادات الحموضة ما عدا الرندين و الإميبرازول				
2	الحديد ومشتقاته				
3	حبوب منع الحمل (أحادي)				
4	حبوب منع الحمل (ثنائي)				
5	المضادات الغدة الدرقية مثل (methimazole)				
6	أدوية حاسمات بيتا مثل (Propranolol Inderal)				
7	أدوية الليثيام (لعلاج الاكتئاب)				
8	دواء البروكور				

3-5 هل عملت صورة موجة فوق صوتية للغدة سابقاً؟

النتيجة:..

4-5 ما نتيجة تحليل عينة نسيج الغدة الدرقية؟..

Annex (7): Experts' arbitration form

السيد /... المحترم

تحية طيبة وبعد:

تحكيم إستبانة

أنا الباحث خليل ابراهيم خليل حمد ، ملتحق ببرنامج ماجستير صحة عامة – علم الأوبئة بجامعة القدس أبو ديس وأقوم بإعداد رسالة الماجستير كمتطلب تكميلي لنيل الدرجة والتي هي بعنوان :

Risk Factors of Hypothyroidism Among Palestinian In Gaza Strip: Case Control Study

.

Objectives

1. To assess the relationship between socio-demographic factors and hypothyroidism

2. To study the relationship between chronic medical diseases and hypothyroidism.

3. To study the relationship between diet and hypothyroidism .

4. To explore the relationship between family history related factors and hypothyroidism .

5. To formulate recommendations to control modifiable risk factors of hypothyroidism and suggest possible and feasible screening activity

أرجو من سيادتكم التكرم والإطلاع على الإستبانة وإفادتنا برأيكم وإقتراحاتكم وإبداء الملاحظات الهادفة للتعديل.

مع خالص الشكر والتقدير

الباحث : خليل ابراهيم خليل حمد

جوال:0599687633

Annex (8): Control panel

No.	Name	Position
1.	Dr. Yahya Abed	Al-Quds University
2.	Dr. Rami Al.Abadlla	Director of HRD-MOH
3.	Dr. Suhail Al-Qishawi	Consultant Endocrinologist
4	Dr. Alla Al-Masri	Medical Director of Nasser Hospital
5.	Dr. Issa Saleh	FDCO-UNRWA
6.	Dr. Mohammad Zughbor	Consultant Endocrinologist – MOH
7.	Dr. Abdel Majid Bashiti	Endocrinologist – MOH
8.	Dr. Yousef Awad	Dean of Nursing Faculty-Palestine University
9.	Dr. Khalil El-Qatrawi	MPH – UNRWA
10.	Dr. Mustafa Shaath	MPH - UNRWA

عوامل الخطورة لخمول الغدة الدرقية بين الفلسطينيين في قطاع غزة- دراسة مقارنة (حالات و شواهد)

إعداد: خليل إبراهيم حمد

إشراف: أ.د. ماجد ياسين

ملخص الدراسة:

قصور الغدة الدرقية هو متلازمة إكلينيكية ناجمة عن نقص في هرمونات الغدة الدرقية ، ويعتبر أحد أكثر اضطرابات الغدد الصماء شيوعًا في العالم.

الهدف من الدراسة هو تقييم عوامل الخطر لحدوث قصور الغدة الدرقية بين الأشخاص الذين يحضرون للمستشفيات الحكومية في قطاع غزة. تم إجراء دراسة مقارنة (الشواهد و الضوابط) على أربعة مستشفيات حكومية هي مستشفى غزة الأوروبي، ومستشفى ناصر، ومستشفى شهداء الأقصى، ومستشفى الشفاء في قطاع غزة. تم اختيار العينة بطريقة أخذ عينات ملائمة مع حجم العينة الإجمالي 300 مشارك (150 حالة و 150 شاهد). وكانت الحالات من المراجعين البالغين الذين تم تشخيصهم بالفعل بوجود قصور الغدة الدرقية والذين حضروا المستشفيات الحكومية المختارة وكانت الشواهد أشخاصًا بالغين لا يعانون من قصور الغدة الدرقية ضمن الأشخاص الذين حضروا المستشفيات الحكومية. تم إجراء المطابقة في نفس المحافظة.

أداة الدراسة هي استبيان محكم .. وقد أجريت العينة التجريبية ونتج عنها بعض التعديلات الطفيفة في الأداة و لم تدخل هذه العينة في الدراسة. وتعتبر قيمة $P \le 0.05$ و / أو فترة الثقة 95 ٪ ذات دلالة إحصائية. بين التحليل ثنائي المتغيرات وجود ارتباط ذو دلالة إحصائية ($P \le 0.05$) بين قصور الغدة الدرقية وبين عوامل الخطر المذكورة: العمر ، الإناث ، المستوى التعليمي ، البطالة ، التاريخ العائلي لأمراض الغدة الدرقية ، التاريخ العائلي لأمراض ارتفاع ضغط الدم ، التاريخ العائلي لأمراض السكر ، وجود تضخم الغدة الدرقية. التهاب الغدة الدرقية بعد الولادة ، تناول مضاد الحموضة ، تناول الحديد ، تناول اللحوم الحمراء 3 مرات وأكثر أسبوعيًا ، وتناول اللحوم الحمراء مرة واحدة إلى مرتين أسبوعيًا، مع تناول الحليب 3 مرات أو أكثر أسبوعيًا وتناول الحليب أقل من مرة أسبوعيًا ، تناول الفول السوداني 1-2 مرة أسبوعيًا وتناول الفول السوداني أقل من مرة أسبوعيًا ، تناول الأناناس ، أكل الزبيب 1-2 مرات أسبوعيا ، وأكل الزبيب أقل من مرة أسبوعيًا ، تناول السمسم أقل من مرة أسبوعيًا ، وأكل الجوز 3 أو أكثر أسبوعيا ، 1-2 مرات أسبوعيا وأقل من مرة واحدة أسبوعيا على التوالي.

وأوصت الدراسة باعتماد نظام رصد و مسح معتمد بشكل جيد لاكتشاف المبكر لقصور الغدة الدرقية ، وتنفيذ برنامج فحص السكان المعرضين لخطر قصور الغدة الدرقية. بالإضافة إلى ذلك ينبغي اعتماد برنامج التثقيف الصحي للعمل على عوامل الخطر القابلة للتعديل لقصور الغدة الدرقية.