

**Deanship of Graduate Studies
Al-Quds University**



**Pregnant Women's Knowledge and Awareness about the
Role of Folic Acid in Preventing Neural Tube Defects at
Governmental Primary Health Care Centers in the
Gaza Strip**

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Governmental Primary Health Care Centers in the
Gaza Strip**

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Thesis Approval

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Jerusalem – Palestine

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Dedication

To my first, support...my dear father

To the delight of my heart...my dear mother

To my beloved husband

To my brothers and sisters and their families for their patience and encouragement

To all of my friends

To my family

To my beloved country..... Palestine

All love and respect

Aisha Hemdan Nayef Alagha

Declaration

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

Signed:



Aisha Hemdan Nayef Alagha

6/12/2022

Acknowledgment

Praise be to Allah, a great, good, and blessed thank you, as it should be for the glory of his countenance and the greatness of his authority. I thank God Almighty for making it easy for me to finish this humble scientific work.

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With my appreciation and respect

Abstract

Background: Folate deficiency is currently one of the most common vitamin deficiencies among women. Low folate intake during pregnancy raises the likelihood of unfavorable pregnancy outcomes, including several birth defects. **Aim:** The study aimed to assess pregnant women's knowledge and awareness about the role of folic acid in preventing neural tube defects (NTDs) at governmental primary health care centers (PHCCs) in the Gaza Strip. **Method and materials:** A descriptive cross-sectional design was used and a non-probability consecutive proportional sample was drawn from respondents attending the seven governmental PHCCs that provide antenatal care (ANC) service in the five governorates. The sample size was 375 pregnant women who visit the ANC service during the study period. Targeted women were interviewed using an interviewing questionnaire, a pilot study was conducted and the study was carried out from June 2021 to November 2022. Cronbach's alpha reliability was 0.815, and validity was assured by experts in the field. All ethical issues were considered during all parts of the study and the SPSS program, version 25 was used to analyze the data. **Results:** Three hundred seventy-five pregnant women participated in the study. The majority of women in this study lived in Khanyounis city (66.6%). Out of the 375 women, (81.6%) were unemployed, and (74.6%) had income less than the 1973 NIS. 10.2% of pregnant women were unaware of folic acid's importance in preventing NTDs, 59.6% had poor knowledge, 15.2% and 15% had intermediate and high knowledge, respectively. Most women (66%) were ignorant of folic acid's role in preventing NTDs. Four people were quite aware. Most women have heard of folic acid and half know its benefits, but less than a quarter know it can prevent NTDs and anemia. Only 22% of women took folic acid pre pregnancy. Ordinal regression shows two predictors that can predict knowledge. First: employment status (OR:1.071, P-value = 0 .003) in that being employed increases the level of women's knowledge of the folic acid role in preventing NTDs by 1.071. Second: having a child with NTDs predict Knowledge (OR :1.394, P-value = .001) in that woman who had a child with NTDs have more knowledge by 1.39 than those has not. Only employment status can predict women's awareness (OR: 0.748, p-value =0.043) in that being employed decrease the level of women's awareness by 0.252. **Conclusion and Recommendations:** Less than a quarter of women know that NTD and anemia can be prevented by taking folic acid supplements. The study recommends increasing the level of women's knowledge about the benefits of folic acid supplements by conducting education sessions targeting any women who visit PHCCs for any reason. Women should be encouraged by health care providers to take folic acid supplements pre-pregnancy and to focus on healthy foods in their diets.

Keywords: Knowledge, Awareness, Folic Acid, Neural Tube Defects, Preconception care

List of abbreviations

AFP	Alpha-Fetoprotein
ANC	Antenatal care
CDC	Center for Disease Control
CI	Confidence Interval
DALY	Disability Adjusted Life Years
DNA	Deoxyribonucleic Acid
EMRO	Eastern Mediterranean Region Office
MCH	Maternal and Child Health
MoH	Ministry of Health
NGOs	Nongovernmental Organization
NIS	New Israeli Shekel
NTDs	Neural Tube Defects
PCC	Preconception Care
PHC	Primary Health Care
PHCCs	Primary Health Care Centers
UNRWA	United Nation Relief and Work Agency for Palestine Refugees in the Near East
USD	United States Dollars
WHO	World Health Organization

Table of Contents

Dedication.....	
Declaration.....	i
Acknowledgment.....	ii
Abstract.....	iii
List of abbreviations	iv
Table of contents	v
List of tables	viii
List of Figures.....	viii
List of Annexes.....	ix
Chapter One Introduction	1
1.1 Background.....	1
1.2 Problem Statement.....	3
1.3 Justification of the study	4
1.4 Study objectives.....	5
1.4.1 General objective	5
1.4.2 Specific objectives	5
1.5 Research Questions.....	6
1.6 Definition of the terms and operational definitions.....	6
1.6.1 Knowledge.....	6
1.6.2 Awareness.....	7
1.6.3 Neural Tube Defects (NTDs)	7
1.7 Context of the study.....	7
1.7.1 Palestinian Healthcare	8
1.7.2 Primary health care centers (PHCCs).....	9

Chapter Two Conceptual Framework and Literature Review	10
2.1 Conceptual Framework.....	10
2.1.1 Sociodemographic characteristics	11
2.1.2 Pregnancy-related characteristics	12
2.1.3 Knowledge-related data.....	12
2.1.3 Awareness related information	13
2.2 Literature review.....	14
2.2.1 NTDs definition.....	14
2.2.2 Classification of NTDs	14
2.2.3 Causation of NTDs	14
2.2.4 Diagnosis of NTDs	15
2.2.5 Screening of NTDs	15
2.2.6 Folic acid	16
2.2.7 Folic acid deficiency and supplementations	16
2.2.8 Preventive effect of Folic acid.....	17
2.2.9 Preconception care (PCC).....	17
2.2.10 Treatment of NTDs.....	18
2.2.11 The burden of NTDs.....	18
2.2.12 Factors affecting pregnant women’s knowledge, awareness, and usage of folic acid	20
2.2.13 Worldwide variances in women’s knowledge of the role folic acid supplements play in preventing NTDs	23
2.2.14 Women’s Awareness of the benefit of folic acid in the prevention of NTDs versus usage over the world	25
Chapter Three Material and Methods	29
3.1 Study design.....	29
3.2 Setting and period of the study	29
3.3 Study population.....	29

3.4	Sample size and sampling.....	29
3.5	Eligibility criteria.....	29
3.6	Data collection technique	30
3.7	Pilot study	30
3.8	Ethical and administrative considerations	30
3.9	Validity and Reliability.....	31
3.9.1	Face and content validity	31
3.9.2	Reliability of the instrument	31
3.10	Data entry and Statistical analysis	32
	Chapter Four Results.....	33
4.1	Descriptive analysis	33
4.2	Inferential analysis.....	41
4.2.1	Knowledge predictors	41
	Chapter Five Discussion.....	43
5.1	Demographic characteristics of study respondents.....	43
5.2	Factors associated with awareness, knowledge, and use of folic acid.....	47
5.2.1	Knowledge predictors	47
5.2.2	Awareness predictors.....	48
	Chapter Six Conclusion and Recommendations	50
6.1	Conclusion	50
6.2	Recommendations.....	50
6.2.1	Recommendations for healthcare providers and decision-makers	50
6.2.2	Recommendations for women and their families	51
6.2.3	Recommendations for future research	51
	References.....	52
	Annexes.....	61

List of tables

Table (3.1): Cronbach’s alpha coefficient for the study domains.	32
Table (4.1): Sociodemographic characteristics of all the pregnant women, of the women who had heard about folic acid, and of the women who used folic acid.....	33
Table (4.2): The classification of pregnant women's knowledge about folic acid.	35
Table (4.3): respondent's responses to knowledge statements	35
Table (4.4): The classification of pregnant women's awareness of folic acid.....	37
Table (4.5): Responses to awareness statements	38
Table (4.6): Multivariate ordinal regression, Knowledge predictors	41
Table (4.7): Multivariate ordinal regression, awareness predictors	42

List of Figures

Figure (2.1): Conceptual framework- Self developed	10
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List of Annexes

Annex 1: Palestine map	61
Annex 2: Gaza Strip map.....	62
Annex 3: Sample size calculation.....	63
Annex 4: Interviewing questionnaire	64
Annex 5: Helsinki committee	71
Annex 6: MoH admin approval	72
Annex 7: Consent form	73
Annex 8: List of experts	74

Chapter One

Introduction

1.1 Background

Pregnancy necessitates a balanced diet to ensure adequate energy intake for fetal growth without relying on the mother's tissues to sustain the pregnancy (De Seymour et al., 2022). Physiological changes in maternal red blood cell mass, as well as the needs of the placenta and fetus development and growth, contribute to a substantial rise in iron requirements during pregnancy. Despite increased iron requirements, pregnancy is associated with a higher risk of anemia than in non-pregnant states (Agbozo et al., 2020; Tay et al., 2013).

Folate deficiency is among the most prevalent vitamin deficits in women today. Low folate intake during pregnancy increases the chance of adverse pregnancy outcomes, including several birth abnormalities (Greenberg et al., 2017). Folic acid is an essential vitamin that cannot be biosynthesized by the human body and must be received through diet or supplements; it is required for rapid cell development and tissue growth in the fetal body of pregnant women (Tekkesin and Taser, 2012).

Folate can be found in a range of foods, including green leafy vegetables like spinach, broccoli, cabbage, and lettuce. It can also be found in animal products such as liver, kidney, eggs, and fish. Furthermore, folate can be found in peanuts, bran, whole-grain bread, bananas, and yeast extract. In some countries, staple foods like wheat flour and rice are fortified with folic acid to prevent deficiency. These foods may not contain enough folate to meet the recommended dietary requirement for pregnant women, and 400 micrograms of folic acid are suggested to prevent maternal anemia, puerperal sepsis, low birth weight, and premature birth as reported by the World Health Organization (WHO, 2016).

A deficiency of folate can lead to certain diseases. The most frequent and devastating outcomes of folate deficiency are congenital deformities such as neural tube defects (NTDs) including anencephaly and Spina bifida (WHO, 2015). Folate deficiency also results in megaloblastic anemia, abruption of placentae, spontaneous abortion, congenital heart defects, and preterm birth. Moreover, in 2012 approximately a quarter of a million neonatal deaths were attributed to congenital abnormalities (WHO, 2015). These defects can be reduced by folic acid supplementation (Shafqat, 2015). Folic acid also prevents congenital heart defects, growth retardation, low birth weight of the infant, smaller head and chest circumference, preterm delivery, and cleft lip (Hassan, 2016).

Congenital anomalies affect an estimated 3% of newborns worldwide. Nearly 50 years ago, it was found that B-vitamin and folic acid play a role in promoting normal embryonic development. It was advised as a general guideline that all females of childbearing age take a supplement of 4 mg of folic acid to reduce the risk of congenital malformations, including NTDs (Valentin et al., 2018). Preconception supplementation with folic acid (before conception and during the first 12 weeks of pregnancy) was found to decrease the risk of NTDs by 50–70 %, while also protecting from other birth defects such as those of the heart, limbs, urinary tract, cleft lip, and palate, as well as other major structural abnormalities (Liu et al., 2018).

Women's knowledge of folic acid role in preventing NTDs varies greatly across the globe, particularly across industrialized and developing nations. Variations in health policies that implement complete MCH services, including provision of PCC programs and ANC services on its best standards, are responsible for these differences. Folic acid awareness among low-income pregnant women in Korea is 97.9%, according to a study. The findings revealed that 81.1% of respondents had heard of folic acid, 30.4% were aware of NTDs, and 47.1% had used folic acid supplements (AL-Mohaithef et al., 2021). Another survey conducted among

expectant mothers in the city of Riyadh from 2019 to 2020 found a higher degree of awareness since a total of 96.1% of them have heard of folic acid use during pregnancy (AlDuraibi & Al-Mutawa, 2020).

Various factors that influence the utilization and adherence to folic acid supplementation are age, socioeconomic status, level of education, fear or experience of side effects, price, usage of health care services, and provision of these supplements at health care centers (Kamau et al., 2018). Very few studies have been conducted about knowledge and factors that affect the utilization of folic acid supplements among pregnant and non-pregnant women in the Gaza Strip.

1.2 Problem Statement

Prevention is always better than treatment for controlling the disease. People's health knowledge and attitude are necessary to plan for prevention. The compliance rate for taking folate supplements increases when consumers are informed (Kamau et al., 2019). There is no doubt that supplementation is needed for pregnant women, however, the challenge remains to improve adherence and commitment to supplementation strategies in many developing countries (Rakanita et al., 2020).

Healthcare authorities in many developed countries have recommended that all women planning to become pregnant should consume additional dietary and supplementary folic acid peri-conceptionally however, despite these recommendations and national campaigns, peri-conceptional intake of additional folic acid remains very low in many countries (Cui et al., 2021; Nasr Hage et al., 2012).

Folic acid is known to play an important role in the prevention of birth defects (Gatt et al., 2016). NTDs are severe congenital anomalies many of which are considered potentially preventable if mothers take adequate folic acid in the peri-conceptional period i.e. from at

least one month before to one month after conception. Folates are required for the normal development and closure of the neural tube in the early stages of embryonic development (neurulation stage embryos) (Copp et al., 2013).

Throughout human history, knowledge has always been an essential component of progress. Every mother must have pregnancy knowledge and experience in order to have a safe delivery and a healthy baby. Women who are aware of the benefits of folic acid in preventing NTDs will have healthier pregnancies because they will be more motivated to take folic acid as prescribed by their doctors.

Understanding women's knowledge and awareness of folic acid are important to determine why they choose to take folic acid supplements or not and how their beliefs shape their health behaviors in this way. This study helps to assess women's knowledge and awareness of folic acid and its role in preventing birth defects among women in the Gaza Strip.

1.3 Justification of the study

Folic acid and iron deficiency are the most common vitamin deficiencies in pregnant women in the Gaza strip. The MoH (2019) records showed that the percentage of anemia among registered women screened in PHCCs is 27.5%, of which 95% is mild anemia, 4.8% is moderate anemia, and 0.1 is severe anemia. They should begin to use supplementation before they become pregnant since 50% of all pregnancies are always unplanned. A pregnant woman needs extra folic acid to help her to produce the additional blood cells needed. Folic acid is crucial also to supporting the rapid growth of the placenta and fetus. This vitamin is needed to produce new Deoxyribonucleic Acid (DNA) as cells multiply (Argyridis, 2019; Lean, 2013).

Without adequate amounts of folic acid, cell division could be impaired, possibly leading to poor growth in the fetus or placenta, women who were more deficient in folic acid were

more likely to have a baby who was premature and of low birth weight and low levels of folate may be a risk factor for repeated early miscarriages. Since these birth defects develop before a woman may even know she is pregnant by the 28th day after conception (Li et al., 2019).

Folic acid is only effective if taken before pregnancy and in the first few weeks of pregnancy. Folic acid is a single element that is known to reduce approximately 70% of all NTDs, which are a group of birth defects known as central nervous system defects that involve abnormalities in the formation of the skull, brain, spine, or spinal cord. Three to four percent of all babies born have significant abnormalities. Birth defects (congenital anomalies) are the leading cause of death in babies under one year of age. NTDs are the second most common type of birth defect, after congenital heart defects, however, (Lean, 2013). This study aims to assess pregnant women in the Gaza Strip's level of knowledge and attitude toward the role of folic acid in preventing NTDs in order to identify factors influencing their knowledge and awareness and to make recommendations in order to increase their level of knowledge and awareness about folic acid supplements, increase their adherence, and decrease morbidities among their children.

1.4 Study objectives

1.4.1 General objective

This study aims to assess pregnant women's knowledge and awareness about the role of folic acid in preventing neural tube defects (NTDs) at governmental primary health care centers in the Gaza Strip.

1.4.2 Specific objectives

- To determine the level of knowledge of pregnant women about the role of folic acid in preventing NTDs.

- To assess the level of awareness of pregnant women about the role of folic acid in preventing NTDs.
- To determine the prevalence of folic acid supplement use in preconception, pregnancy, and compliance with folic acid recommendations.
- To predict factors that affect the knowledge of pregnant women about the role of folic acid in preventing NTDs.
- To predict factors that affect the awareness of pregnant women about the role of folic acid in preventing NTDs.

1.5 Research Questions

- 1- What is the level of pregnant women's knowledge about the role of folic acid in preventing NTDs?
- 2- What is the level of pregnant women's awareness about the role of folic acid in preventing NTDs?
- 3- What are the sources of pregnant women's knowledge regarding folic acid?
- 4- What are the explanatory factors that could predict women's knowledge about the role of folic acid in preventing NTDs?
- 5- What are the explanatory factors that could predict women's awareness of the role of folic acid in preventing NTDs?

1.6 Definition of the terms and operational definitions

1.6.1 Knowledge

Knowledge refers to information that is, to a greater or lesser extent, detailed and factual (Trevethan, 2017). In the current study, the researcher defines knowledge as the pregnant women's ability to recall the facts and information regarding folic acid sources, the advantages of using folic acid, and defects due to folic acid deficiency. Knowledge level was

measured through part of the questionnaire and was scored as clarified in the methodology chapter.

1.6.2 Awareness

Awareness is associated with personally relevant information (Trevethan, 2017). In the current study, the researcher defines awareness as pregnant women's conception of folic acid regarding the number of antenatal visits, planning of pregnancy, number of pregnancies, and educational level. Awareness level was measured through part of the questionnaire and was scored as clarified in the methodology chapter.

1.6.3 Neural Tube Defects (NTDs)

NTDs are serious birth anomalies that interfere with the development of the brain and spinal cord, resulting in permanent impairment or even premature death. NTDs occur when the neural tube fails to properly close and create the embryonic central nervous system during the first 21 to 28 days of gestation (Yasmin et al., 2022).

1.7 Context of the study

West Bank and Gaza Strip are politically different Palestinian areas. (Annex 1). Gaza, a tiny strip of land, borders Egypt to the south, the Mediterranean Sea to the west (Annex 2), and 1948-occupied regions to the east and north. The Gaza Strip is 46 km long, 5–12 km wide, and 365 km².

North, Gaza, Mid-zone, Khanyounis, and Rafah are Gaza Strip administrative divisions. It has four towns, fourteen villages, and eight refugee camps. 2,048,969. Population density is 5,154/km². With a population growth rate of 2.9% and a fertility rate of 3.9%, 41.3% of the Gaza Strip's population is under 15, making it extremely young (PCBS, 2020).

1.7.1 Palestinian Healthcare

The MoH, United Nation Relief and Work Agency for Palestine Refugees in the Near East (UNRWA), Nongovernmental Organization (NGOs), and the non-profit private sector make up the Palestinian Health Care System. The principal provider is the Ministry of Health (MoH), which runs 27 hospitals (14 in the West Bank and 13 in the Gaza Strip) and 444 primary health care centers (PHCCs). Importantly, UNRWA runs 140 PHCCs (Health program, UNRWA, 2021).

Despite many challenges, the Palestinian MoH works with the international community and the United Nations, particularly the WHO, to prevent the collapse of the Palestinian health system and obtain the best health indicators in the East Mediterranean region. It offers school health, health education, human resources development, and referrals to non-MoH institutions for services not available at government facilities. From 1994 to 2020, the MoH, Palestine has 475 PHCCs, up 134% (MoH, 2020 b). The hospital services are provided by the government and NGOs, both of which have significantly improved over the years in terms of infrastructure, technical and support services by adding new departments and diagnostic equipment and by offering ongoing professional training. In 2020, Palestine had a total of 87 hospitals, of which 53 were located in the West Bank, constituting 61% of the total hospitals in Palestine. There are 6,552 hospital beds in Palestine (including mental and neurological institutions) at a rate of 12.8 beds per 10,000 people. The total number of MoH hospitals is 28, with 15 hospitals in the West Bank and 13 hospitals in the Gaza Strip, with a total bed capacity of 3,590, representing 54.8% of all beds in Palestine (MoH, 2020 b). According to the MoH annual report, there were 997 physicians and experts working in Gaza Strip government facilities (MoH, 2020 a).

1.7.2 Primary health care centers (PHCCs)

There are 158 PHCCs in GS, 52 are owned by MoH, 22 are owned by UNRWA, five are owned by the military medical services, and the rest are owned by NGOs and the private sector. The MoH classifies PHCCs into four levels. Level I, level II, Level III

Level IV centers Provide preventive services, mother and child health care, immunization, family planning, and health education. The Preconception Care (PCC) program in Maternal and Child Health (MCH) is for one year.

The total number of pregnancies in the Gaza Strip in 2019 was 48,029 of them 14,248 registered at MoH centers. The fertility rate is 3.2/ woman in reproductive age which differs from that of 2012; 3/ woman in reproductive age (MoH, 2020 a).

Chapter Two

Conceptual Framework and Literature Review

2.1 Conceptual Framework

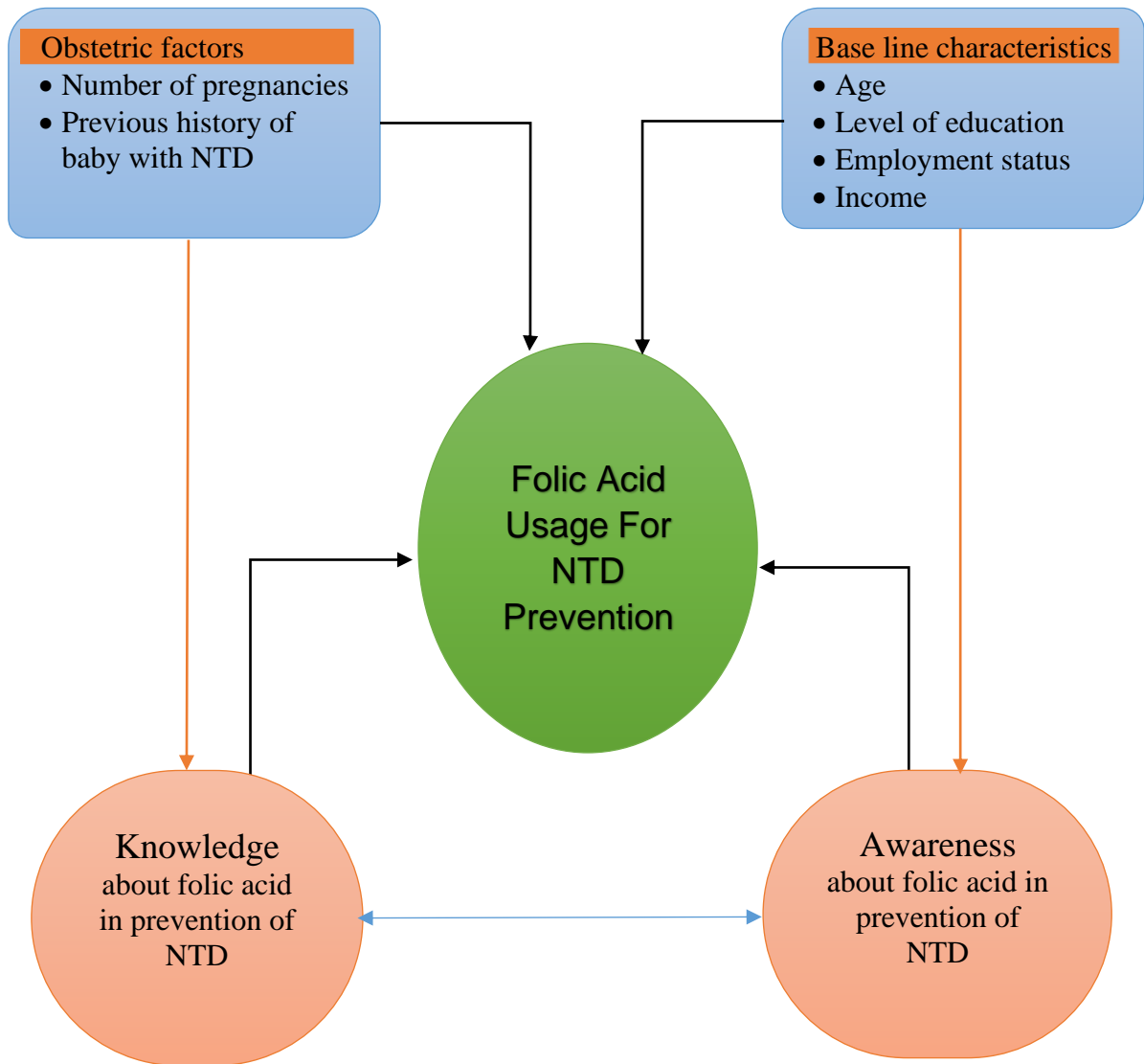


Figure (2.1): Conceptual framework- Self developed

2.1.1 Sociodemographic characteristics

Age, education level, employment status, and monthly income are a few examples of sociodemographic characteristics. The researcher investigated how these variables impact women's knowledge of the benefits of folic acid in avoiding NTDs and how that data is translated into usage. The next paragraphs will explain each variable.

Women's ages were recorded in years, and the age at marriage was also determined. The researcher during the study evaluated the relationship between women's aging and their increased knowledge, awareness, and use of folic acid as a preventive measure against NTDs. It is believed that as women become older, they will become more knowledgeable, alert, and concerned about their health and the condition of their babies.

A multiple-choice question was used to determine the study participants' level of education. The association between women's education level and their knowledge of and awareness of the benefits of folic acid and the subsequent usage of folic acid for preventative purposes was highlighted by the researcher. Depending on their employment status, participants were classified as either working or not working during the study period. It was incorporated into the questionnaire since it is thought to have an impact on women's fundamental awareness and knowledge. The level of income was calculated using the household's monthly income. A question with three possible answers is used to evaluate it. Income levels are expected to have an impact on the usage of folic acid, especially in nations where it must be purchased because it is not freely available. Assessments of participant residences were done to see if there were any differences in participant knowledge and awareness of folic acid according to the governorate.

2.1.2 Pregnancy-related characteristics

The number of pregnancies, abortions, live children, and dead children, together with the reporting of the inter-pregnancy interval in months or years, was used to analyze the obstetric history of study participants. It was also mentioned whether any study participants had children with birth defects or impairments, with the participant being asked to specify the type if present.

To ascertain whether there are variances in women's knowledge and awareness based on their obstetric history, the aforementioned factors were reported.

2.1.3 Knowledge-related data

Knowledge has always been an essential component of advancement throughout the history of humanity. To have a safe delivery and a healthy baby, every mother needs to have pregnancy knowledge and experience. Women who are knowledgeable of folic acid benefits to prevent NTDs will have healthier pregnancies because they will be more motivated to take folic acid consistently as directed by their doctors.

Although the effectiveness of folic acid to prevent NTDs has been well proven via scientific data since the 1990s, and despite its availability for free to the majority of women in Palestinian society, where it is supplied through UNRWA clinics and the government's PHCCs, as a crucial part of the delivery of PCC preventive measures, and through routine antenatal care (ANC) activities, not all women use folic acid supplements as recommended. One explanation for this is the lack of knowledge of its benefits in preventing NTDs and anemia.

Answering general questions about folic acid using a multiple-choice format assisted measure the knowledge domain. The following information was gathered:

Participants knew folic acid, correctly identified its advantages, accurately predicted the diseases and birth defects that the use of folic acid would prevent, accurately reported their frequency of use, accurately selected foods containing folic acid, and most importantly, correctly identified the most advantageous time for folic acid use.

Consequently, based on the participant's responses, the researcher described the general degree of knowledge among women attending governmental PHCC in the Gaza Strip. Further, the researcher examined the relationships between several variables that are thought to have an obvious impact on women's knowledge, whether they be associated with socioeconomic variables or other obstetric parameters.

2.1.3 Awareness related information

Learning more about folic acid supplements and their protective role in the prevention of NTDs is thought to be a key motivator for adhering to the recommended dosage of folic acid supplements for the optimum pregnancy outcome.

The following data was collected by the researcher during the assessment of the awareness domain utilizing multiple-choice questions: Participants were asked if they had ever taken folic acid when they did so during a previous pregnancy, whether they used it on a prescription or not, whether they had planned or unplanned pregnancies, why they currently take folic acid and why they don't, whether they used folic acid as part of a multivitamin or as a single vitamin, where they got their information from regarding folic acid, and finally, a question designed to assess the attitudes toward folic acid use in their future pregnancies.

2.2 Literature review

2.2.1 NTDs definition

The NTDs are serious birth disorders that disrupt the growth of the brain and spinal cord and can result in permanent disability or even early death. NTDs arise when the neural tube fails to correctly shut and establish the embryonic central nervous system in the first 21 to 28 days of pregnancy (Yasmin et al., 2022).

2.2.2 Classification of NTDs

The general definition of NTDs includes several deformities. They primarily fall under the categories of open and closed. Anencephaly and spina bifida are examples of conditions where primary neurulation fails, leading to open NTDs. Spina bifida occulta, which mostly has no symptoms, and severe spinal cord tethering are examples of closed NTDs that affect the skin-covered spinal cord structure (Copp and Shaw, 2015).

2.2.3 Causation of NTDs

2.2.3.1 Genetic etiology

NTDs were found to be associated with mutations in folate-responsive or folate-dependent pathways, according to genetic analyses (Cai et al., 2019).

A recently published review study claims that the substantial concordance of NTDs between monozygotic twins (7.7%) compared to like sex/dizygotic twins (4.0%) provides evidence for genetic etiology. Furthermore, the recurrence risk is just 5% and does not rise above 10% even after two affected pregnancies, which strongly contradicts a monogenic origin (Finnell et al., 2021). This evidence is compatible with a multifactorial polygenic pattern of inheritance rather than a hypothesis based on single dominant or recessive genes with partial

penetrance because neural tube abnormalities occur with a sporadic but varying incidence around the world (Copp et al., 2015).

1.1.1.1 Environmental etiology

Fewer non-genetic factors have been positively linked to human NTDs. According to Ponzano & Tiboni (2018), valproic acid, a common anticonvulsant, has been found to about 10-fold increase the incidence of NTDs when taken during the first trimester. As revealed by Finnell et al. (2021), a significant number of known human teratogens, such as industrial waste, pollutants, and some pharmaceutical compounds, contribute to the genesis of NTDs. Additionally, well-known and published risk factors include maternal obesity or diabetes, toxins, malnutrition, and hyperthermia (Cai et al., 2019).

2.2.4 Diagnosis of NTDs

Alpha-Fetoprotein (AFP) concentration measurements in the mother's blood and amniotic fluid were initially used to diagnose NTDs, but later technical advancements allowed ultrasound to take its position as the primary prenatal diagnosis method (Medlineplus, 2022).

2.2.5 Screening of NTDs

Second-trimester anatomical sonography scans with thorough fetal intracranial and spinal imaging are the main screening approach utilized to find NTDs. First-trimester sonographic screening, maternal serum AFP, and prenatal magnetic resonance imaging are further screening techniques for expectant mothers at high risk of developing NTDs (Wilson et al., 2021).

2.2.6 Folic acid

Although the terms folate and folic acid are frequently used interchangeably, folic acid is a synthetic version of the water-soluble B vitamin folate, while folate is a naturally occurring B vitamin (B9) found in foods. Folate is essential for the creation of DNA and neurotransmitters because it serves as a coenzyme. Additionally, it is crucial throughout the embryonic and fetal stages of pregnancy, when there is fast cell division and tissue expansion. It is also involved in amino acid metabolism and cell multiplication (Mousa et al., 2019). Multivitamins, prenatal vitamins, and a pure folic acid supplement all include folic acid. To achieve proper baseline folate levels, it has also been added to some oral contraceptive pills as well as flour, pasta, pieces of bread, cereals, cornmeal, and rice to ensure adequate baseline folate levels in the event of unplanned pregnancy (Sarmah et al., 2016).

2.2.7 Folic acid deficiency and supplementations

The primary etiologic factor thought to be involved in the etiology of NTDs is folic acid deficiency. Red blood cell folate reflects folate storage and is deemed insufficient at levels below 340 nmol/L. In general, the cutoff criterion to establish folic acid deficiency is a serum folate level below 10 nmol/L, which evaluates the recent intake. Folate concentrations biologically decline during pregnancy, but there is no single cutoff limit for pregnancy because of increasing folate demands to support changes in blood volume, hormone levels, and fetal organ development (Mousa et al., 2019). Although consuming enough food remains the recommended way for satisfying the general population's nutritional needs, pregnant women's micronutrient needs are challenging to satisfy by diet alone. Therefore, the WHO (2016) advised taking daily supplements of oral iron and folic acid to avoid anemia in pregnancy and lower pregnancy-related problems.

2.2.8 Preventive effect of Folic acid

The use of maternal folic acid supplements has been found to significantly lower the incidence of NTDs, which is one of the most important methods in the prevention of birth abnormalities, according to the findings of the Medical Research Council Vitamin Study (1991). (Greene et al., 2017).

The first trimester and preconception period are crucial for supplementation, which can prevent 40–80% of NTDs (Mousa et al., 2019)

2.2.8.1 Preventive strategies

- Women with a low risk of developing NTDs need to consume foods high in folate and take a daily oral multivitamin supplement containing 400 mcg folic acid and vitamin B12 for at least two to three months before conception, for the duration of the pregnancy, for four to six weeks following delivery, or for as long as she is lactating.
- Women with a moderate risk of developing NTDs need to consume foods high in folate and take a daily oral multivitamin supplement containing 1.0 mg folic acid. This regimen should be followed by women until 12 weeks pregnant.
- Women at high risk for NTDs require a diet of folate-rich foods and daily oral supplementation with 4.0 to 5.0 mg folic acid and vitamin B12 for at least 3 months before conception and until 12 weeks gestation (Wilson et al., 2021).

2.2.9 Preconception care (PCC)

The PCC is a set of prevention and treatment strategies that aims to identify and alter biomedical, behavioral, and social risks to a woman's health or pregnancy outcome by focusing on the elements that must be altered before conception or early in pregnancy to have the best possible health outcome. It has been ranked as a top priority for enhancing

maternal, newborn, and child health. One of the main goals of the Palestinian National Reproductive plan (2018–2022) is to enhance maternal and childhood outcomes and integration and implementation of PCC programs are supported as one of those goals (MOH, 2020 b). Utilizing folic acid supplements at least three months before conception has been shown to have the best results in lowering the risk of NTDs as reported by Center for Disease Control (CDC, 2022).

2.2.10 Treatment of NTDs

NTDs are often serious problems and treatment options are very limited. Babies born with spina bifida have varying degrees of impairment, but babies born with anencephaly cannot live for more than a few weeks. Consequently, it is crucial to avoid disease by supplementing with folic acid during the protective period (Jin, 2017). According to Shimony (2018) in his modified assessment of NTDs, neurosurgical surgery is the basis of treatment for open NTDs whereas closed NTDs don't require immediate surgical correction. The mortality and morbidity rates of afflicted persons have significantly decreased as a result of breakthroughs in surgical repair.

2.2.11 The burden of NTDs

2.2.11.1 Global burden of NTDs

It is well known that estimates of the burden of NTDs differ around the world. Several databases were utilized in a systematic literature review to determine the prevalence rates of NTDs. The median prevalence rates were found to be around 6.9 per 10,000 births in the Western Pacific, 9.0 per 10,000 in Europe, 11.5 in the Americas, and 11.7 births in Africa and Southeast Asia, it was approximately 15.8 per 10,000 births (Zaganjor et al., 2016).

The prevalence ranges between 0.5 and 2 per 1000 births in nations where folic acid supplementation is not accessible (Berhane & Belachew, 2022).

Referring to a recent investigation by Kancherla et al. (2021) to assess the burden of NTDs, the findings revealed that 1 year of folic acid fortification might prevent an estimated 5.4 million disability adjusted life years (DALYs). Additionally, 31.8 billion United States Dollars (USD) in economic value would be produced.

2.2.11.2 The burden of NTDs in the nations in the Eastern Mediterranean Region Office (EMRO)

The EMRO area had the highest median NTDs prevalence rate of 21.9 per 10,000 live births among the investigated regions, according to the aforementioned systematic research. The estimated frequency of NTDs in this area varied significantly, with rates as low as 2.1 per 10,000 live births in the United Arab Emirates and as high as 124.1 per 10,000 live births in Pakistan (Zaganjor et al., 2016).

2.2.11.3 The burden of NTDs in Palestine

2.2.11.3.1 Physical Burden

According to the Palestinian Health Information Center, a significant percentage of congenital abnormalities between 2014 and 2018 contributed to 17.2-24% of under-five mortality (MoH, 2020 a). On the frequency of NTDs in Palestine, no official statistics exist.

Prior research carried out in East Jerusalem and the Southern West Bank in 1997 found extremely high frequency when compared to several other Arab nations. Between 1986 and 1993, the study calculated a prevalence rate of 54.9 per 10,000 births (Zaganjor et al., 2016)

2.2.11.3.2 Psychological Burden

Due to differences in religion, family dynamics, social interactions, cultural attitudes, and finally health care and rehabilitation services, children with NTDs and their families face various challenges in different countries.

The Palestinian society is distinct from that of other low-income and developing nations in that it is immersed in a region of political conflict that has stressed the nation's infrastructure and economy in addition to its fragile, fragmented health care system. The psychological health of the NTDs survivors is impacted by these variables as they experience additional stressors in addition to their disease and disability.

In the West Bank, according to Nahal (2019), children with spina bifida feel stigmatized, socially isolated, and fully reliant, and they do not have the same possibilities for habilitation, education, and training as children have in other countries.

The study also examines the experiences of their mothers and depicted the mothers' sad tales, which showed how they had difficulties in their day-to-day activities and struggled to safeguard and promote their children's health. They experience persistent worry, uncertainty, stress, and a challenging environment in their daily lives.

2.2.12 Factors affecting pregnant women's knowledge, awareness, and usage of folic acid

The researcher divided the primary elements that may be related to the general women's knowledge, awareness, and use of folic acid into two categories after evaluating the relevant articles. The first group focuses on sociodemographic information about the research participants, whereas the second group is interested in information on the individuals' obstetric history. The implications of these possible usage-determining factors for folic acid were discussed in the paragraphs that followed.

2.2.12.1 Sociodemographic characteristics

2.2.12.1.1 Age

According to previous studies, there is debate over how age affects women's knowledge, awareness, and use of folic acid over the advised period. While Dessie and colleagues (2017)

studied the influence of age on folic acid use, they found that folic acid use was significantly associated with advanced age as women who were above 25 years old were 9.4 folds more users of folic acid at the protective period than women younger than 25, and this finding was consistent with other studies in the USA. Kim et al.'s study (2017) among Korean women found no significant difference in folic acid uptake between different age groups. In contrast to the aforementioned findings, research that examined Qatari teachers of reproductive age's awareness of folic acid use revealed a different impact of age on folic acid awareness, with the younger teachers who were below 35 years old being more aware of the protective effects of folic acid. This might be because modern technology is more readily available and makes it easier to obtain accurate and precise medical information (Lolowa et al., 2019).

2.2.12.1.2 Education level

In various research investigations, women's educational attainment was an important independent predictor for folic acid knowledge and utilization; typically, knowledge was strongest among those with higher levels of education. Women with a university degree or higher education levels were more likely to be aware of folic acid preventive role in NTDs and to consume it during the preconception period, according to Kim et al. (2017) research. Numerous diverse studies that have evaluated the impact of education on folic acid knowledge and use came to the same conclusion. However, the findings of a study among Ethiopian women showed that there was no significant relationship between folic acid use and the women's level of education (Dessie et al., 2017).

In Palestine, a newly released study that examined women's awareness and behavior toward PCC programs found that educated women were more knowledgeable than non-educated about PCC services and its many preventative measures (Al-Kasseh. et al., 2022).

2.2.12.1.3 Employment status

Concerning pregnant women's employment status, a recent study on pregnant women's knowledge of nutritional habits in Southern Ethiopia demonstrated that pregnant women who work in the government are six times more likely to be knowledgeable than pregnant housewives (Gezimu et al., 2022).

2.2.12.1.4 Income level

In several earlier research, income level has been identified among the factors that influence how much women of reproductive age are knowledgeable and aware of folic acid benefits. According to Cowan et al. (2018), low income was linked to poor supplement intake among U.S. adults in their study on dietary supplementation. This is because supplements are not covered by government insurance, therefore they must be purchased. Additionally, a recent study among Saudi pregnant women found a strong relationship between participants' income and folic acid use during pregnancy, with those with higher incomes being more likely to take folic acid supplements (Al-Marwani & Al-Zahrani, 2022).

2.2.12.1.5 Governorate

According to the reviewed literature, there are differences in pregnant women's understanding of folic acid protective effect depending on where they live. This may be connected to the geographic accessibility to standard MCH services involving optimal ANC services and comprehensive PCC programs. The findings of a prior study conducted in Palestine to evaluate medicine usage among pregnant women revealed a strong relationship between place of residence and folic acid use (Sawalha, 2007).

2.2.12.2 Pregnancy-related characteristics

According to various studies, prior obstetric history was a significant factor in the consistent use of folic acid during the preventive period. Dessie et al. (2017) found that early antenatal

registration, preconception consultation, pregnancy planning, and a history of failed pregnancies were substantially associated with folic acid uptake for NTDs prevention.

Women who were nulligravid were less aware of the advantages of preconception folic acid supplementation, based on a recent study in England that evaluated the knowledge of women of reproductive age for potential exposures in the preconception period (Daly et al., 2022). AL-Mohaithef et al. (2021) discovered that Saudi women who had previously given birth had a greater level of understanding about the appropriate dosage of folic acid.

2.2.13 Worldwide variances in women's knowledge of the role folic acid supplements play in preventing NTDs

According to Hlushko et al. (2021), who investigated the knowledge of folic acid use and its consequences among Ukrainian medical students, nearly all respondents (96.5%) knew that folic acid is a water-soluble vitamin B9, the majority of students (87.7%) said that folic acid should be taken before pregnancy and 90.4% of them said that folic acid should be taken during pregnancy and 95.6% of students correctly identified at least one product as having the greatest content of folate. The majority of those surveyed (97.4%) were aware that a fetus could develop some pathology in the absence of folic acid, while fewer respondents (86.8%) were aware that folic acid also protected against NTDs. The study participants' comparatively high level of knowledge may have been caused by the fact that the participants were medical students.

Similarly, in a study on folic acid awareness among low-income pregnant women in Korea, the majority of women (97.9%) reported having heard of folic acid, 65.6% had heard of it before becoming pregnant, 85.4% were aware of folic acid role in preventing NTDs, and 77.7% knew when to take it (Kim et al., 2017).

In contrast to the earlier surveys, an even more recent study amongst married women in Pakistan showed incredibly low levels of knowledge. The majority of respondents (85.4%, and 76.7%, respectively) reported being unaware of NTDs and folic acid. Based on this, the majority of participants (86.2%) stated to be unaware of the fact that folic acid reduces the risk of NTDs and didn't have used folic acid while pregnant (Yasmin et al., 2022).

Concerning Arab nations, a recent study at Saudi Electronic University among female students evaluated folic acid awareness and usage. The findings revealed that 81.1% of respondents had heard of folic acid, 30.4% were aware of NTDs, and 47.1% had used folic acid supplements (AL-Mohaithef et al., 2021). This comparatively low degree of awareness may be caused by the study participants' diverse demographic makeup, as nearly half of them never got pregnant, nor were married at all, and more than two-thirds were enrolled in non-health science faculties (AL-Mohaithef et al., 2021).

Another survey conducted among expectant mothers in the city of Riyadh from 2019 to 2020 found a higher degree of understanding since a total of 96.1% of them have heard of folic acid use during pregnancy. Additionally, 73.4% of women are aware that folic acid is used before conception, and 87.9% of women are aware of the role that folic acid plays during pregnancy (AlDuraibi & Al-Mutawa, 2020). Because the bulk of the research participant's pregnancies was of parity one and above, the relatively high knowledge rate among them may be due to prior consumption of folic acid supplements during those pregnancies (AlDuraibi & Al-Mutawa, 2020).

In a study conducted by Lolowa and colleagues in 2019 on the knowledge and intake of folic acid among teachers in the State of Qatar who were of childbearing age, the findings revealed that 88% of participants had heard of folic acid and that more than half had heard of NTDs. Only 34.6% of participants correctly identified the ideal time to take folic acid, 28.3%

correctly identified the appropriate intake duration, and only 29.5% correctly identified folic acid rich foods. In conclusion, there is a glaring lack of information and consequently inadequate intake of folic acid among the participants. This could be attributed to the healthcare practitioners' restricted counseling, as reported by the study respondents.

In an earlier study in Libya, that reviewed pregnant women's knowledge, opinions, and practices about folic acid use, it was found that nearly three-quarters had heard of folic acid and that just over one-third had correctly identified its advantages. 16% were aware of the ideal time to supplement with folic acid when pregnant, and 12% were aware of the foods that contain folic acid (Abdulmalek L. and Abdulmalek J., 2017).

To date, few studies have been carried out in Palestine to demonstrate the folic acid use by pregnant women and there is no available data on the knowledge and awareness of pregnant women of the preventive role of folic acid on NTDs. In a recently published study, Palestinian mothers were asked to assess their overall knowledge of PCC services in PHCCs. The results showed moderate knowledge of PCC services, with the highest mean in the knowledge domain coming from women's knowledge about the importance of consuming folic acid before pregnancy at 75% (Al-Kasseh et al., 2022).

2.2.14 Women's Awareness of the benefit of folic acid in the prevention of NTDs versus usage over the world

2.2.14.1 Folic acid use, timing, frequency, and duration

Previous investigations have shown that folic acid consumption for NTD prevention has varying levels of awareness worldwide. Hlushko et al. (2021) claimed that even though there is a high level of general knowledge about folic acid and its effects among their respondents, there is a low awareness of preconception usage, which is why only 10% of participants

reported using folic acid supplements regularly. In agreement with this, a Korean study found that only 24.6% of women use folic acid before getting pregnant (Kim et al., 2017).

Even though Dessie et al. (2017) reported that 48.4 % of respondents of pregnant women in an Ethiopian study used folic acid supplements at various points during their pregnancies, just 1.92% of participants did so at the advised times. In regards to the frequency of use, the majority (77.3%) used folic acid every day, 10.9% did forget 1-2 times a week, and 6.6% used it off and on. In terms of the average duration of use, among women who consumed folic acid during their current pregnancy, 6.9% used it for less than one month, while the majority 83.9% used it for one to three months. According to the researcher, this low level of commitment to using folic acid as recommended for protective purposes is due to a lack of awareness about the role of folic acid supplements, as PCC services are not consistently provided in Ethiopia.

Based on the Abdulmalek L. and Abdulmalek J. (2017), only 27% of women consumed folic acid during their current pregnancy. Approximately three-quarters of them used it after the first month. Only 6% used it before pregnancy. The majority of people took supplements daily. This apparent lack of awareness among the participants could be attributed to the fact that they were primigravida who had never used folic acid before. A promising finding from the same study revealed that approximately 88% of pregnant women have a favorable attitude toward using folic acid in future pregnancies.

In comparison, the findings of Lolowa et al. (2019) study among female Qatari teachers revealed that nearly half of the participants were currently using folic acid, one-third were correctly aware of the optimal period for folic acid use as a precautionary measure of NTDs, and 28.3 percent of the surveyed reported the correct duration of use.

Another study among pregnant Saudi women revealed that over 96% of them were completely aware of the benefits of taking folic acid supplements while pregnant, almost 89% had done so in prior pregnancies, and roughly 75% had used folic acid before becoming pregnant. This high level of awareness and utilization may be attributed to the comprehensive primary health care (PHC) services with full integration of PCC programs as one of its core components, as well as the ANC's outstanding services (AlDuraibi & Al-Mutawa, 2020).

There is currently little available information regarding the use of folic acid supplements by pregnant women in Palestine, however, a study by Sawalha (2007) found that 48.6% of them do. Most of them began using folic acid in the second month of pregnancy, and this disagrees with the national guidelines that advocated using it before conception.

2.2.14.2 Primary sources of folic acid knowledge

According to the aforementioned Korean study, healthcare experts were the primary sources of folic acid information, followed by, the mass media, and finally, friends and family members (Kim et al., 2017).

The majority of participants in a study carried out in Pakistan by Yasmin et al. (2022) stated that they would prefer to obtain the relevant information through their doctor.

AL-Mohaithef and colleagues (2021) also noted that health organizations and professionals were commonly mentioned as major sources of knowledge about folic acid usage by research participants, Abdulmalek L. and Abdulmalek J., (2017) found that 78% of pregnant women in Libya relied heavily on the advice provided by healthcare professionals.

Contrary to popular, only 27% of participants in Lolowa et al. (2019) reported getting information on folic acid use from their primary healthcare doctors, whereas over two-thirds of patients said they got it from the women's hospital.

2.2.14.3 Folic acid supplementation among pregnant women due to prescription or non-prescription

One of the primary causes behind the nonuse of folic acid was the failure to prescribe it by healthcare providers during the ideal period, according to a study conducted by Coll et al. (2000) for NTDs in the Mediterranean region (Lolowa et al., 2019).

The Dessie et al. (2017) study found that only 54.9% of the women had folic acid prescribed for their current pregnancy; while half of the women were not prescribed folic acid, and this necessitating policymakers' action to ensure that healthcare practitioners are fully aware of the significance of folic acid prescription.

2.2.14.4 Reasons for not taking folic acid as prescribed

Reviewing the literature revealed a variety of reasons why folic acid supplementation was not being used regularly as directed. Yasmin et al. (2022), who studied the primary causes of folic acid non-usage, stated that lack of adequate ANC, restricted availability of folic acid supplements, and family members who forbade the use of vitamins were all key factors. In the Qatari study, the lack of personal information about folic acid was the most frequent reason for non-use, with nearly 44% of participants reporting that they did not receive enough information from their healthcare providers, while 9.2% of participants stated that it was because they were using numerous other medications (Lolowa et al., 2019).

Chapter Three

Material and Methods

3.1 Study design

The study design is a descriptive cross-sectional study. Typically, cross-sectional studies are conducted on a population at a single point in time or over a brief period. Additionally, it evaluates the relationship between variables and is economical, swift, and readily handled (Wang & Cheng, 2020).

3.2 Setting and period of the study

The study was carried out at seven governmental PHCCs that are concerned with providing ANC (Al Rimal Martyrs PHCC, Deir Al-Balah Martyrs PHCC, Khanyounis Martyrs PHCC, Abasan Alkabira PHCC, Abasan Alsakhira PHCC, Bani Sohaila PHCC). The study was conducted during the period from June 2021 to Nov. 2022

3.3 Study population

The target population was pregnant women visiting the governmental PHCCs during the study period.

3.4 Sample size and sampling

According to MoH annual report, there are 16350 pregnant women annually, accordingly, the sample size was calculated by using Epi info version 7 and the sample included 375 participants drawn from target clinics (Annex 3). A non-probability consecutive proportional sample was drawn from respondents attending the seven governmental primary healthcare clinics based on inclusion criteria that serve pregnant women in the five governorates.

3.5 Eligibility criteria

The study included pregnant women, who visited the governmental PHCCs

during the data collection period and the age from 20-45 years old.

3.6 Data collection technique

Data were collected using an interviewing questionnaire (Annex 4). The time estimate for questionnaire filling is 10–15 minutes. The purpose of the study was explained to the participants after obtaining their written personal permission to participate in the study. The procedure of data collection was consistent for each participant.

The questionnaire consisted of three parts

- **Part 1:** related to sociodemographic data of the study participants including age, education level, occupation, and income and obstetric data including the number of children and previous children with NTD
- **Part 2:** Consisted of statements related to pregnant mothers' knowledge about folic acid, 8 questions
- **Part 3:** Consisted of statements related to pregnant mothers' awareness of folic acid during pregnancy. 11 questions

3.7 Pilot study

A pilot study was conducted including 10% of the participants (40) before starting the actual data collection phase to provide feedback about the study questionnaire, test response rate, ensure the reliability of the questionnaire as well as identify the area of ambiguity. Slight modifications were done and the data of the pilot study were included in the analysis.

3.8 Ethical and administrative considerations

The researcher was committed to all administrative and ethical considerations before starting data collection. Ethical approval was obtained from the Helsinki committee (Annex 5) and MOH in the Gaza strip (Annex 6) after approval of Al-Quds University to conduct this study.

Also, anonymity, and confidentiality were maintained during data collection and all women were informed that their participation is voluntary and they can withdraw from the study at any time through the consent form (Annex 7).

3.9 Validity and Reliability

3.9.1 Face and content validity

It was conducted before data collection with the help of experts (Annex 8) to ensure relevancy, clarity, and completeness. Content validity is a subjective estimate of measurement based on judgment rather than statistical analysis. To validate the instrument used, the designed questionnaire with a cover letter, title, and objectives of the study was sent to experts from different backgrounds including MCH, researchers, and public health experts in the environmental field. The experts were asked to estimate the relevance, clarity, and completeness of each item; some questions were modified with the help of the supervisor.

3.9.2 Reliability of the instrument

Reliability is the extent to which results are consistent over time and an accurate representation of the total population under study. To increase the reliability, the data collection procedure was standardized, 5% of the data were reentered the statistical analysis program, and the reliability coefficient was measured using Cronbach's alpha coefficient as shown in Table (3.1). For the whole questionnaire, it was 0.815 indicated that the questionnaire was reliable, as previously stated that a result greater than 0.70 was accepted and considered reliable (Taber, 2018).

Table (3.1): Cronbach's alpha coefficient for the study domains.

Domain	Cronbach's Alpha coefficient	No. of statement
Knowledge	0.758	21
Awareness	0.710	20
Total	0.815	41

3.10 Data entry and Statistical analysis

To achieve the goal of the study, the researcher used Statistical Package for Social Sciences (SPSS) version 25 for analyzing the data. The researcher used descriptive and inferential statistics such as frequencies, mean, standard deviation, and percentages for the women's knowledge and awareness. To assess the level of knowledge about the role of folic acid in preventing NTDs among pregnant women, the researcher used 8 questions with 21 items, and to assess the level of awareness, it was used 11 questions with 20 items.

Knowledge and awareness domains were classified as, lack of awareness or knowledge when the score is less than 33.3, low level with a score between 33.4 and 55.5, intermediate level when the score is from 55.6 to 77.8, and high level of awareness when the score is higher than 77.8 (Riazi et al., 2012). Ordinal regression was used to predict factors affecting the knowledge and awareness of women. Confidence Interval (CI) was considered at 95% and a margin of error below 0.05 is statistically significant.

Chapter Four

Results

In this chapter, the study findings are presented. These findings answer the research questions formulated in the introductory chapter regarding the level of participants' knowledge and awareness of pregnant women about the role of folic acid in preventing NTDs. Then, we interpreted the main results and compared them with the international findings.

4.1 Descriptive analysis

Table (4.1): Sociodemographic characteristics of all the pregnant women, of the women who had heard about folic acid, and of the women who used folic acid.

Variable	Total	Heard about folic acid	Used folic acid
Folic acid	374	353	313
Age group			
15 – 24 years	83 (22.2%)	73 (20.7%)	56 (17.9%)
25 – 34 years	178 (47.6%)	173 (49%)	158 (50.5%)
35 – 45 years	113 (30.2%)	107 (30.3%)	99 (31.6%)
Education level			
Elementary	3 (0.8%)	3 (0.8%)	3 (1%)
Preparatory	5 (1.3%)	5 (1.4%)	5 (1.6%)
Secondary	121 (32.4%)	105 (29.8%)	90 (28.8%)
Diploma	68 (18.2%)	66 (18.7%)	56 (17.9%)
Bachelor	163 (43.6%)	160 (45.3%)	147 (47%)
Postgraduate	14 (3.7%)	14 (4%)	12 (3.7%)
Employment status (n=373)			
Employed	68 (18.2%)	68 (18.2%)	61(16.3%)
Unemployed	305 (81.6%)	283 (75.6%)	252 (67.3%)
History of birth defect (n= 354)			
Yes	32 (9)	31 (9.3%)	27 (8.9%)
No	322 (91)	304 (90.7%)	276 (91.1%)
Number of living children (n= 372)			
≤ 2	247 (66.4%)	232 (66.3%)	196 (62.8%)
3–5	113 (30.4%)	107 (30.6%)	105 (33.7%)
≥ 6	12 (3.2%)	11 (3.1%)	11 (3.5%)
Monthly family income (n= 362)			
Less than 1973 NIS	270 (74.6%)	251 (73.2%)	221 (72.5%)
Less than 2490 NIS	68 (18.8%)	68 (19.8%)	64 (21%)
More than 2490 NIS	24 (6.6%)	24 (7%)	20 (6.6%)

NIS: New Israeli Shekel

Table (4.1) shows the sociodemographic characteristics of all the pregnant women in the study, of the women who had heard about folic acid, and of the women who used folic acid.

The age of participants was ranging from 17 to 41 years old, with a mean of 29.8 (SD = 6.3), and most of the target sample was from the age group 25 to 34 years old (47.6%). Regarding the age of marriage, it ranged between 14 and 45 years old (mean = 22.4, SD = 4.4). Regarding the level of education, it was found that three participants had received only elementary education, also five participants had reached only preparatory education, while (32.4%) had secondary education, (18.2%) of the women had diploma degrees, (43.6%) of the women had bachelor's degree and (3.7%) had a postgraduate degree. Out of the 375 women, (81.6%) were unemployed, and (74.6%) of them had an income less than the 1973 NIS which can be considered absolute poverty, (18.8%) of the surveyed women had an income less than 2490 NIS which is considered at the poverty line. The majority of women in this study lived in Khanyounis city (249, 66.6%), Gaza city (19.5%), and the middle governorate (131.1%). This distribution corresponds to the health centers from which the data was collected, with Khanyounis health center collecting 66% of the data. The number of pregnancies ranged from zero to 14 pregnancies with a median of 3 pregnancies. While abortion ranged from zero to 12 abortions. The number of their living children ranged from 1 to 9 children with a median of 2. Out of the total sample, (7.5%) had a dead child, and (8.6%) had a child with a birth defect.

There were (94.1%), of pregnant women who heard about folic acid with 46.2 percent of those women from 25 to 34 years old hearing about it. The women in the age groups 15 to 24 who heard about folic acid accounted for 20.7%, and the women in the age groups 35 to 45 accounted for 30.3%. (43.6%) of the women who had a bachelor's degree heard about folic acid, and almost all unemployed and employed women heard about folic acid.

Most of the women had used folic acid (83.7%), the age group from 25 to 34 years old had the highest usage percentage of using folic acid (50.5%), as well as the women who had a bachelor's degree (47%).

Table (4.2): The classification of pregnant women's knowledge about folic acid.

Levels	N (%)	Mean (SD)	Min	Max
Lack of knowledge	38 (10.2%)	23.15 (3.7)	13.3	26.6
Low level	223 (59.6%)	41.04 (8)	33.3	53.3
Intermediate level	57 (15.2%)	67.01 (5.25)	60	73.3
High level	56 (15.0)	86.19 (5.06)	80	93.3

It was found, that (10.2%) of pregnant women had lack knowledge regarding the role of folic acid in preventing NTDs, the majority had a low level of knowledge (59.6%), and almost equal numbers of women had an intermediate and high level of knowledge (15.2%, and 15%) respectively and 10.2% have lack of knowledge as shown in Table (4.2):

Table (4.3): respondent's responses to knowledge statements

Question		N (%)	Correct
1. Have you heard about folic acid?	Yes	352 (94.4)	352 (94.4%)
	No	21 (5.6)	
2. Do you know what the benefits of folic acid are?	Yes	194 (52)	194 (52%)
	No	179 (48)	
3. How often are you supposed to take folic acid?	Daily	324 (86.9)	324 (86.9%)
	Once a week	2 (0.5)	
	2-3 times a week	4 (1.1)	
	3-4 times a week	0	
	5-6 times a week	2 (0.5)	
	I don't know	41 (11)	
4. Which of the following diseases/birth defects can folic acid be prevented?	Anemia	109 (29.3)	153 (40.9)
	Autism	6 (1.6)	
	Cystic fibrosis	3 (0.8%)	
	Down syndrome	16 (4.3%)	
	Defects of the neural tube	153 (40.9%)	
	Thrombosis	11 (3%)	
	Heart and blood vessel diseases	12 (3.2%)	
	I don't know	168 (44.9%)	

Table (4.3): Continued

5. Did you know about the benefits of folic acid related to birth defects at any of the following points in time?	At that time, I was thinking about getting pregnant for the first time	59 (16.1%)	59 (16.1%)
	While I stopped using contraceptive methods	7 (1.9%)	
	At that time, I was pregnant with my first child	173 (47.3%)	
	I didn't know about the benefits of folic acid in any of the points mentioned above	127 (34.7%)	
6. Do you know food containing Folic acid?	Yes	133 (35.8%)	133 (35.8%)
	No	238 (64.2%)	
Fruits	Yes	116 (31%)	116 (31%)
	No	258 (69)	
Green vegetables	Yes	128(34.2%)	128(34.2%)
	No	246 (65.8%)	
The milk	Yes	29 (7.8%)	345 (92.2%)
	No	345 (92.2%)	
Fish / seafood	Yes	54 (14.5%)	319 (85.5%)
	No	319 (85.5%)	
Meat-	Yes	52 (13.9%)	322 (86.1%)
	No	322 (86.1%)	
The bread	Yes	91 (24.3%)	91 (24.3%)
	No	283 (75.7%)	
Whole grains	Yes	118 (31.6%)	118 (31.6%)
	No	256 (68.4%)	
7. Folic acid supplements are more important for	Pre-pregnancy	39 (10.5)	39 (10.5%)
	1st trimester	257 (69.3)	
	3rd trimester	5 (1.3)	
	Don't know	69 (18.6)	

Table (4.3) demonstrates women's responses to the knowledge statements and the percentage of women who have correct answers to these questions. As it was mentioned previously, 94.4% of the participants have heard about folic acid. However, only (52%) of the women knew about the benefits of folic acid in preventing NTDs, while the other (47%) of the women reported that they did not know the benefits of folic acid, and (86.9%) of the total sample reported that they knew that folic acid should be taken daily, while (11%) did not know.

Out of the total women, (29.3%) knew that folic acid can prevent anemia, and (40.9%) knew that folic acid can prevent NTDs but only 21.4% know that it could prevent the two. Also, (44.9%) of the women had no idea about the disease that could be prevented by taking folic acid.

Regarding the appropriate time for using folic acid in preventing NTDs, (47.3%) had reported that they knew about the benefits of folic acid after they got pregnant for the first time, while (16.1%) knew that when they were thinking about the pregnancy of their first child.

Many women did not know the food types that contain folic acid (64.2%), also 31.0% of the women knew that fruits contain folic acid, (65.8%) did not know that green vegetables contain folic acid, and the majority knew that milk does not contain folic acid (92.2%). Also, they knew that sea foods and red meat do not contain folic acid (85.3%), (86.1%) respectively, while (75.7%) did not know that bread contains folic acid as well as (68.4%) of the women did not know that whole grains contain folic acid.

Regarding the important time for using folic acid to prevent NTDs, the majority of the women answered that the most important time was the 1st trimester (69.3%).

Table (4.4): The classification of pregnant women's awareness of folic acid.

Levels	N (%)	Mean (SD)	Min	Max
Lack of awareness	75 (20.1%)	30.9 (11.01)	0	30
Low level	247 (66%)	44.9 (6.5)	35	55
Intermediate level	48 (12.8%)	63.95 (3.85)	60	75
High level	4 (1.1%)	–	–	–

Table (4.4) describes the awareness categories among the study respondents. It was found, that (20.1%) of pregnant women had lack of awareness regarding the role of folic acid in preventing NTDs, the majority had a low level of awareness (66%), 12.8% had intermediate level of awareness and finally only 4 (1.1%) pregnant women had high level of awareness.

Table (4.5): Responses to awareness statements

Question		N (%)	Correct
1. Have you ever taken folic acid?	Yes	313 (85.3)	313 (85.3%)
	No	54 (14.7)	
2. If yes, the duration of taking the folic acid as supplements in the previous pregnancies since when,	Pre-pregnancy	72 (22.8)	72 (22.8%)
	First month	81 (25.6)	
	Second month	67 (21.2)	
	Third month	96 (30.4)	
3. Are you currently taking a folic acid supplement?	Yes	301 (81.1)	301 (81.1%)
	No	70 (18.9)	
4. If yes, since when,	Pre-pregnancy.	99 (31.5)	99(31.5%)
	First month	94 (25.1)	
	Second month	81 (25.8)	
	Third month	40 (12.7)	
5. What are the reasons that you are currently taking or have been taking folic acid before?			
A doctor/healthcare professional advised me to do so	Yes	332 (88.8)	332 (88.8%)
	No	42 (11.2)	
A friend/relative advised me to take it	Yes	48 (12.8%)	48 (12.8%)
	No	326 (87.2%)	
Because I have anemia	Yes	14 (3.7%)	14 (3.7%)
	No	360 (96.3%)	
Because I am planning to become pregnant	Yes	37 (9.9%)	37 (9.9%)
	No	337 (90.1%)	
Because I am pregnant	Yes	84 (22.5%)	84 (22.5%)
	No	290 (77.5%)	
Because it has general health benefits	Yes	52 (13.9%)	52 (13.9%)
	No	322 (86.1%)	
I read about it and heard that it would be good for me	Yes	61 (16.3%)	61 (16.3%)
	No	312 (83.4%)	
Because it is found in my multivitamins	Yes	33 (8.8%)	33 (8.8%)
	No	341 (91.2%)	

Table (4.5): Continued

Because I have a folic acid deficiency	Yes	7 (1.9%)	7 (1.9%)
	No	367 (98.1%)	
Because I may not get enough folic acid in my regular diet	Yes	147 (39.3%)	147 (39.3%)
	No	227 (60.7%)	
1. Is the folic acid supplement you are currently taking prescribed or without a prescription?	Yes	324 (92.6)	324 (92.6%)
	No	26 (7.4)	
2. Is the folic acid supplement you are currently taking a multi-vitamin product or a single vitamin supplement?	A multivitamin product	100 (28.2)	164 (46.2%)
	One vitamin supplement that contains only folic acid	164 (46.2)	
	I do not know	91 (25.6)	
3. If you use folic acid, how many times have you forgotten or chosen not to take your folic acid tablet?	Absolutely	218 (62.3)	218 (62.3%)
	One day out of 7	61 (17.4)	
	Two days out of 7	23 (6.1)	
	3 days out of 7	28 (8)	
	4 days out of 7	10 (2.9)	
	5 days out of 7	4 (1.1)	
	6 days out of 7	2 (0.6)	
	7 days out of 7	4 (1.1)	
4. Did you receive any advice/information on taking folic acid whether you were pregnant or while you were considering pregnancy?	Yes	318 (87.4)	318 (87.4%)
	No	46 (12.6)	
5. Did you take folic acid during pregnancy or when you were trying to get pregnant for the first time?	Yes	328 (87.7%)	328 (87.7%)
	No	38 (10.3%)	
6. To what extent do you will take a folic acid pill?	Absolutely improbable	7 (1.9)	259 (71.7%)
	Not Likely	10 (2.8)	
	Acceptable	59 (16.3)	
	somewhat likely	26 (7.2)	
	Very Possible	259 (71.7)	

Table (4.5) demonstrates women's responses to the awareness statements and the percentage of women who have correct answers to these questions. Most of the women had used folic acid (85.3%), among those who had used folic acid, (22.8%) of the women used folic acid pre-pregnancy. Out of the total target group, (81.1%) were using folic acid at the time of data collection, and those who started taking folic acid pre-pregnancy only (31.5%).

Regarding the reasons for using folic acid, (88.8%) of the women started taking folic acid after advice or recommendation of the physician, while being pregnant was not a reason for folic acid use among (77.5%), also it was found that planning to get pregnant was not a reason to use folic acid (90.1%). Having anemia was not also a reason for using folic acid, but (39.3%) of the women reported that they take folic acid supplements as they did not have a sufficient amount of folic acid in their diet.

Most of the women were using folic acid with a prescription (92.6%). Most of the women (46.2%) were taking folic acid as one vitamin supplement that contains only folic acid. Most of those women who are using folic acid took it as a daily supplement (62.3%).

The majority of the women (87.4%) had used folic acid during the first pregnancy or during the planning to get pregnant for the first time. In addition, (71.7%) of the women are most likely to use folic acid in the future.

4.2 Inferential analysis

4.2.1 Knowledge predictors

Table 4.6): Multivariate ordinal regression, Knowledge predictors

Variable	Odds ratio, 95% CI	P-value
Age group		
15 – 24 years	-.341 (-1.328 - .647)	0.499
25 – 34 years	.013 (-.624 - .651)	0.967
35 – 45 years	(Ref.)	
Level of education		
Elementary	.901 (-1.828 - 3.630)	0.518
Preparatory	.289 (-2.178 - 2.757)	0.818
Secondary	-1.662 (-3.346 - .022)	0.053
Diploma	-1.342 (-3.002 - .319)	0.113
Bachelor	-.490 (-2.037 - 1.058)	0.535
Postgraduate	(Ref.)	
Employment status		
Employed	1.071 (.421 - 1.720)	0.003*
Unemployed	(Ref.)	
Monthly income		
Less than 1973 NIS	-.710 (-1.867 - .446)	0.229
Less than 2490 NIS	-.674 (-1.870 - .523)	0.270
More than 2490 NIS	(Ref.)	
Having a child with a birth defect		
Yes	1.394 (2.225, .564)	0.001*
No	(Ref.)	
Number of children		
≤ 2	.448 (-1.118 - 2.015)	0.575
3–5	.606 (-.770 -1.982)	0.388
≥ 6	(Ref.)	

* *Statistically significant*

Table (4.6) demonstrates the results of ordinal regression to predict demographic and obstetric variables affecting women's knowledge. Six variables were included in the model (age, level of education, employment status, monthly income, having a child of a previous child with NTDs, and several children). The model revealed two explanatory factors affecting women's knowledge. First: employment status, a statistically significant relationship was found between the level of knowledge and employment status (OR =1.071, P-value = 0 .003), Being employed increases the level of knowledge of the folic acid role in preventing NTD by 1.071 times. Second: having a child with NTD. A statistically significant

relationship was found between the level of knowledge and having a child with a birth defect. A woman who has a child with NTD has more knowledge by 1.39 than those has not (OR = 1.394, P-value = .001).

Table (4.7): Multivariate ordinal regression, awareness predictors

Variable	Odds ratio, 95% CI	P-value
Age group		
15 – 24 years	-.210 (-.947 - .527)	0.576
25 – 34 years	.247 (-.334 - .827)	0.405
35 – 45 years	(Ref.)	
Level of education		
Elementary	-2.79 (-5.923 - .343)	0.081
Preparatory	.199 (-2.503 - 2.901)	0.885
Secondary	-.370 (-2.177 - 1.437)	0.688
Diploma	-.351 (-2.150 - 1.448)	0.702
Bachelor	.170 (-1.513 - 1.853)	0.843
Postgraduate	(Ref.)	
Employment status		
Employed	.748 (.025 - 1.470)	0.043*
Unemployed	(Ref.)	
Monthly income		
Less than 1973 NIS	-.687 (-2.005 - .632)	0.307
Less than 2490 NIS	-.028 (-1.373 - 1.318)	0.967
More than 2490 NIS	(Ref.)	
Having a child with a birth defect		
Yes	-.201 (-1.040 - .638)	0.638
No	(Ref.)	
Number of children		
≤ 2	1.136 (-.136 - 2.409)	0.080
3–5	.781 (-.471 - 2.034)	.221
≥ 6	(Ref.)	

* *Statistically significant*

Table (4.7) illustrates the results of ordinal regression to predict demographic and obstetric variables affecting women's awareness. Six variables were included in the model (age, level of education, employment status, monthly income, having a child of a previous child with NTDs, and a number of children). The model revealed only one explanatory factor that affects women's awareness. Employment status, a statistically significant relationship was found between the level of awareness and employment status (OR: .748, p-value =0.043). Being employed decrease the level of awareness by 0.252.

Chapter Five

Discussion

5.1 Demographic characteristics of study respondents

In this study, the age range of respondents was 17 to 41 years old, with the highest participation among women 25 to 34 years old (47.7%), which is considered to be the best reproductive period for a woman. A majority of marriages took place between 14 and 45 years old (mean = 22.4). The age group of the late 20s to early 30s tended to have the highest participation in most studies (Riazi et al., 2012).

Nearly half of the target population in the study had a university degree, and 43.6% had a bachelor's degree. Similar results were found in many studies (AlDuraibi & Al-Mutawa, 2020; (Kim et al., 2018), while study results in Egypt indicated that most women had only received secondary education (Riazi et al., 2012).

Housewives accounted for 81.6% of the respondents, and 72.2% of the respondents had incomes under 1973 NIS per month, which is considered low revenue and is considered below the poverty line as it was previously determined (PCBS, 2016).

For the women who had heard about folic acid, their main source of knowledge was the physician, reported by 92.0%; other sources of knowledge were the family, nurses, pharmacists, media, books, and the Internet (8.0%) (Al Darzi, Al Mudares, Farah, Ali, & Marzouk, 2014).

The number of pregnancies ranged from zero to 14 pregnancies with a median of 3 pregnancies. While abortion ranged from zero to 12 abortions. The number of their living children ranged from 1 to 9 children with a median of 2. Out of the total sample, (7.5%) had a dead child, and (8.6%) had a child with a birth defect. It was found in a similar study that

5.9% of women had histories of not using folic acid supplementation and had abnormal offspring (AlDuraibi & Al-Mutawa, 2020).

In studies of the Arabic countries, the number of pregnancies was less than two pregnancies in Egypt (Al Darzi et al., 2014), In United Arab Emirates, it was also found that the median of two pregnancies (Al Hossani et al., 2010).

Pregnant Women's knowledge and awareness of folic acid's role in preventing NTDs. Based on the results of the study, it was found that (10.2%) of pregnant women had lack knowledge about the role of folic acid in preventing NTDs, the majority had a low level of knowledge (59.6%), and almost the same percentage of women had an intermediate and high level of knowledge (15.2%) (15%) respectively. Almost all of the participating women in the study have heard about folic acid (94.1%), and those who ever used folic acid (83.6%).

A previous study in Palestine showed that less than fifty percent of pregnant women took folic acid (Sawalha, 2015).

In comparison with previous studies, it showed that the percentage of women with a high level of knowledge was (7.8%), (43.8%) of the women had an intermediate level, (30.4%) with low-level knowledge, and 18% with no knowledge (Riazi et al., 2012). Some studies used scores to assess the knowledge, which was found that 82% of the women had general knowledge about folic acid, while only 20% reported that they know that folic acid reduces birth defects (Sharp et al., 2009). The use of folic acid for the prevention of congenital anomalies was known by 48.2% of participants (Köken et al., 2013). It was reported that 65.5% of the women heard about folic acid before pregnancy, while 26.4% used folic acid preconception (Kim et al., 2017).

Approximately 67% of women had heard of folic acid, and 22.0% knew that folic acid is a vitamin. The proportions of women who knew the roles of folic acid in preventing birth were 35.7% (Kim et al., 2018).

According to this study, half of the women (51.9%) knew about the benefits of folic acid in preventing NTDs, and (86.6%) of the total sample reported that they knew that folic acid should be taken daily, while (11%) did not know, and (40.9%) of the women knew that folic acid can prevent NTDs. On the other hand, only 21.4% of women knew that folic acid could prevent anemia and NTDs. Regarding the appropriate time for using folic acid in preventing NTDs, (46.3%) had reported that they knew about the benefits of folic acid after they got pregnant for the first time. In terms of the appropriate time to use folic acid to prevent NTDs, (46%) said they knew about the benefits of folic acid after becoming pregnant for the first time, while (15.8%) knew that when they were thinking about becoming pregnant for the first time.

In another study, (62.4%) of women had heard about folic acid. Only (12.0%) of women knew it was important to take folic acid before pregnancy and (8.2%) knew about taking it in both the preconception and 1st trimester periods (Al Darzi et al., 2014).

In this study, many women did not know the food types that contain folic acid (63.3%), it was shown in the previous study almost the same percentage of women who did not know the food that contains folic acid (63.7%) (Al Hossani et al., 2010).

Regarding awareness of the role of folic acid in preventing NTDs, the majority of the women had a low level of awareness (66%), while (20%) of the women had lack of awareness of the folic acid's role in preventing NTDs, and (12.8%) of them had an intermediate level.

In previous studies, the percentage of women who had awareness of the role of folic acid in preventing NTDs was 79% (Al Hossani et al., 2010), and (18.9%) of the women who knew

the benefits of folic acid in preventing NTDs (Riazi et al., 2012). Also, the level of awareness in another study was found to be 42.2% (Köken et al., 2013).

Of women who had already used folic acid, (22.8%) had taken it before pregnancy, and (21.7%) had begun taking it during their first trimester. Out of the total target group, (80.5%) were using folic acid at the time of data collection, and those who started taking folic acid pre-pregnancy only (26.5%). The same results were found in previous studies, almost (22%) of the women knew that folic acid should be taken before pregnancy (Riazi et al., 2012), 15.4% of the women in another study reported that they knew that taking folic acid preconception can prevent against NTDs (Mashayekhi et al., 2011).

The majority of the women had information about the role of folic acid in preventing NTDs from the gynecologist and the internet, while a very small percentage reported that they got the information from the primary healthcare doctors and midwives, which is strange to find as most of the primary health care facilities are focusing in the PCC programs.

Regarding the source of information about folic acid, it was revealed that hospitals and health centers are the two major sources of increasing awareness (Riazi et al., 2012). Also, another study, showed that the main sources of information about the benefits of folic acid for women were health professionals, friends, family members, and the media (Kim et al., 2017).

86.6% of the women knew that folic acid should be taken daily, and it should be prescribed by a doctor. In comparison with the previous study, 96 % of the women knew the dose of folic acid usage (Riazi et al., 2012).

5.2 Factors associated with awareness, knowledge, and use of folic acid

5.2.1 Knowledge predictors

A statistically significant relationship was shown between knowledge levels and employed women. There was a statistically significant relationship between knowledge, education, employment, time of prenatal care beginning, age, gravidity, and sources of health information. The number of women with a high level of knowledge was more among those with lower parity, higher levels of education, employment, young age, and looking for health information (Riazi et al., 2012). Higher educational levels and planned pregnancy were related to the total rate of knowledge about folic acid (Cui et al., 2021). The Association between education level and knowledge of folic acid's role in preventing NTDs was statistically significant in most research (Hisam et al., 2014).

Comparatively, older women, more educated women, and married women were more likely to have heard of folic acid and have sufficient knowledge of it than younger women, less educated women, and unmarried women (Kim et al., 2018).

Having a bachelor's degree or higher was associated with knowledge of folic acid deficiency leading to NTDs, and specialization in health sciences was associated with knowledge of natural sources of folic acid. Similarly, marriage was found to be associated with knowledge of the correct dosage of folic acid and the timing of folic acid to prevent NTDs. Experience of pregnancy was found to be associated with good total knowledge of folic acid (Al-Mohaithef et al., 2021).

It was shown that low socioeconomic status was significantly associated with low periconceptual folic acid knowledge, but with a higher intention to seek out PCC. An association was found between educational level and ethnicity, showing that the higher the educational level the lower the gap in the level of knowledge between the different ethnic

groups (Temel et al., 2015). Overall it was found that knowledge is associated more with reproductive age groups, well-educated participants, and those having two or more children (Rehan et al., 2015).

Another factor that resulted to be a predictor for women's knowledge is having a child with a birth defect. The result could be interpreted by the following the birth of a child with a disability caused by this vitamin deficiency, these women sought information on the problem and contacted healthcare providers, increasing their knowledge of the disease in comparison to their counterparts.

5.2.2 Awareness predictors

In this research, only one predictor was found to affect the women's awareness negatively; employment status. This is probably related to the employed woman's obsession with her job's tasks and the lack of time she has to organize her life and preserve her health and the health of her fetus. Previously, it was found that awareness of folic acid's role was statistically associated with university education (Kim et al., 2017), high incomes over \$25,000, having health insurance, and being employed (Sharp et al., 2009). Women aged 25–34 years, college students, and married women were more likely to be aware of and know folic acid (Kim et al., 2018).

Having a chronic health problem, monthly household income, educational status, and a history of family planning use affected women's awareness of preconception folic acid supplementation. Women with a good monthly income, a chronic health problem, and a history of family planning were more aware than their counterparts (Goshu et al., 2018)

Age 35 years and knowledge of the benefits of folic acid were positively associated with periconceptual folic acid use, while multiparity was negatively associated. In comparison with those who took folic acid supplements periconceptionally, women who did not take

supplements received information passively and less interactively (Yamamoto & Wada, 2018). Younger age, higher education level, and stability/sufficiency of income appeared to be significant predictors of awareness among pregnant women (Nasr Hage et al., 2012).

Marriage was found to be associated with awareness of folic acid and also health sciences specialization and experience of pregnancy were associated with the usage of folic acid (Al-Mohaithef et al., 2021). Being enrolled in a health college and at a higher educational year level were significant positive correlates of higher knowledge and awareness of the role of folic acid supplements in preventing NTDs (Sabi et al., 2022). The inconsistent findings between studies could be related to the different contexts, cultures, and sample size

Chapter Six

Conclusion and Recommendations

6.1 Conclusion

The study aimed to assess the level of knowledge and awareness about the role of folic acid in preventing NTDs at governmental PHCCs in the Gaza Strip. The majority had a low level of knowledge, and virtually equal percentages had an intermediate and high level of knowledge. The majority of women had a low level of awareness, while less than quarter were unaware of folic acid's involvement in preventing NTDs. Only four individuals had a high level of awareness. The majority of women have heard about folic acid and fifty of them knew about its benefits and less than a quarter knew that NTDs and anemia could be prevented by folic acid supplements. The majority of women took folic acid in their life however, only 19% took it pre-pregnancy. Knowledge is affected by two predictors; employment status, and previously having a child with NTDs. On the other hand, only one predictor affects women's awareness; employment status.

6.2 Recommendations

Based on the study results the researcher recommends the followings:

6.2.1 Recommendations for healthcare providers and decision-makers

- To increase the level of women's knowledge about the benefits of folic acid supplements by conducting education sessions targeting any women who visit PHCCs for any reason.
- To educate women about the best time to take folic acid supplements when planning for a new pregnancy.
- To give interest in this topic in the clinic's brochures, posters, and boards containing encouraging phrases.
- Women should be encouraged by health care providers to take folic acid supplements pre-pregnancy and to focus on healthy foods in their diets.

6.2.2 Recommendations for women and their families

- Women, husbands, and their families should give PCC an interest and should use the service when planning for a new pregnancy.
- Every woman and her husband should plan for every pregnancy and should take folic acid when planning for a new pregnancy.
- Women should follow the recommendations of their healthcare providers and adhere to their visits, treatment, and nutritional supplement regimens.

6.2.3 Recommendations for future research

- To research to examine other factors that affect women's knowledge and awareness including social and psychological factors.
- To conduct a similar study to cover more obstetric variables such as using family planning services, ANC services, and the presence of certain gynecological diseases.
- Mixed method (quantitative and qualitative) research is recommended to dig deeper into factors affecting the knowledge and awareness of women about the role of folic acid in the prevention of anemia, NTDs, and other diseases

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Annexes

Annex (1): Palestine map



Annex (2): Gaza Strip map



Annex (3): Sample size calculation

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StatCalc - Sample Size and Power

Population survey or descriptive study
For simple random sampling, leave design effect and clusters equal to 1.

Population size:	<input style="width: 80%;" type="text" value="16350"/>		Confidence Level	Cluster Size	Total Sample
			80%	163	163
Expected frequency:	<input style="width: 80%;" type="text" value="50"/>	%	90%	266	266
Acceptable Margin of Error:	<input style="width: 80%;" type="text" value="5"/>	%	95%	375	375
			97%	458	458
Design effect:	<input style="width: 80%;" type="text" value="1.0"/>		99%	638	638
			99.9%	1015	1015
Clusters:	<input style="width: 80%;" type="text" value="1"/>		99.99%	1386	1386

Annex (4): Interviewing questionnaire

Place a sign (✓) in the appropriate place: (Sociodemographic variables)

1. Age: years
2. Age at marriage: years
3. Weight in Kg
4. Height In meter
5. Educational level:
 - a. Elementary
 - b. Preparatory
 - c. Secondary
 - d. Diploma
 - e. Bachelor's degree
 - f. Postgraduate studies
6. Employment status
 - a. Employed
 - b. Unemployed
7. Monthly family income:
 - a. Less than 1973 NIS
 - b. Less than 2490 NIS
 - c. More than 2490 NIS
8. Health center/clinic:
9. Governorate:
10. The number of pregnancies
11. The number of abortions

12. The number of living children
13. The number of children who died
14. Does any of the children have birth defects or disability?
a. Yes b. No
15. If the answer is yes, it may be mentioned
16. The period between the previous pregnancy and the current pregnancy
month / year

Please circle the appropriate answer:

Knowledge (Related questions)

1. Have you heard about folic acid?
 - a. Yes
 - b. No
2. Do you know what are the benefits of folic acid?
 - a. Yes
 - b. No
3. How often are you supposed to take folic acid?
 - a. Daily
 - b. Once a week
 - c. 2-3 times a week
 - d. 3-4 times a week
 - e. 5-6 times a week
 - f. I don't know

4. Which of the following diseases/birth defects can folic acid be prevented? (Please check all that apply)
- Anemia
 - Autism
 - Cystic fibrosis
 - Down syndrome
 - Defects of the neural tube
 - Thrombosis
 - Heart and blood vessel diseases
 - I don't know
5. Did you know about the benefits of folic acid related to birth defects at any of the following points in time?
- At that time I was thinking about getting pregnant for the first time
 - While I stopped using contraceptive methods
 - At that time, I was pregnant with my first child
 - I didn't know about the benefits of folic acid in any of the points mentioned above
6. Do you know food containing Folic acid?
- Yes
 - No
7. If yes, what kind of foods do you think are a source of folic acid?

Fruits	<u>Yes</u>	No
Green vegetables	<u>Yes</u>	No
The milk	Yes	<u>No</u>
Fish / seafood	Yes	<u>No</u>
Meat-	Yes	<u>No</u>
The bread	<u>Yes</u>	No
Whole grains	<u>Yes</u>	No

8. Folic acid supplements are more important for
- Prepregnancy
 - 1st trimester
 - 3rd trimester
 - Don't know

Awareness (Related questions)

9. Have you ever taken folic acid?

- a. Yes
- b. No

10. If yes, the duration of taking the folic acid as supplements in the previous pregnancies since when,

- a. Pre-pregnancy
- b. First month
- c. Second month
- d. Third month

11. Are you currently taking a folic acid supplement?

- a. Yes
- b. No

12. If yes, since when,

- a. Pre-pregnancy
- b. First month
- c. Second month
- d. Third month

13. What are the reasons that you are currently taking or have been taking folic acid before? (Please tick all that apply)

	Yes	No
A doctor/healthcare professional advised me to do so		
A friend/relative advised me to take it		
Because I have anemia		
Because I am planning to become pregnant		
Because I am pregnant		
Because it has general health benefits		
I read about it and heard that it would be good for me		
Because it is found in my multivitamins		
Because I have a folic acid deficiency		
Because I may not get enough folic acid in my regular diet		
Other (please specify)		

14. Is the folic acid supplement you are currently taking prescribed or without a prescription?
- by prescription
 - Without a prescription
15. Is the folic acid supplement you are currently taking a multi-vitamin product or a single vitamin supplement?
- A multivitamin product
 - One vitamin supplement that contains only folic acid
 - I do not know
16. If you use folic acid, how many times have you forgotten or chosen not to take your folic acid tablet?
- Absolutely
 - One day out of 7
 - Two days out of 7
 - 3 days out of 7
 - 4 days out of 7
 - 5 days out of 7
 - 6 days out of 7
 - 7 days out of 7
17. Please think about getting pregnant with your first child, was it a planned or unplanned pregnancy?
- Planned
 - Not planned
18. After you discovered pregnancy with your first child (using a pregnancy test), how much time has passed for you to see a gynecologist or other healthcare professional?
- one week or less
 - Two weeks
 - 3 weeks
 - 4 weeks
 - 5 weeks or more
 - I do not recall

19. Did you receive any advice/information on taking folic acid whether you were pregnant or while you were considering pregnancy?
- a. Yes
 - b. No
20. What are the sources of information that made you aware of taking folic acid during pregnancy or while you were considering pregnancy? (Please tick all that apply)
- b. Gynecologist
 - c. Primary care physician / general practitioner
 - d. A midwife
 - e. wise / nurse
 - f. A pharmacist
 - g. Friends
 - h. The husband
 - i. Parents
 - j. Brothers and Sisters
 - k. I knew that I should take folic acid
 - l. I read about it in a magazine or newspaper
 - m. I read about it in an introductory flyer
 - n. I saw something about it on the Internet
 - o. I saw something about it on TV
 - p. I don't remember
21. Did you take folic acid during pregnancy or when you were trying to get pregnant for the first time?
- a. Yes
 - b. No
22. If you did not use folic acid, what are the reasons for not consuming folic acid when you were pregnant for the first time or when you were trying to become pregnant for the first time?
- a. I did not know that it was important/necessary to take it / I did not know about it
 - b. Folic acid benefits that I did not know
 - c. There was enough folic acid in my diet
 - d. No one advised me to take it
 - e. I forgot to take it regularly

- f. I thought it might have a negative impact
- g. vitamins can cause digestive problems
- h. I felt very sick when taken
- i. I don't like eating pills every day
- j. Because of the costs
- k. Other (please specify)

23. to what extent do you will take a folic acid pill?

- a. Absolutely improbable
- b. Not Likely
- c. Acceptable
- d. somewhat likely
- e. Very Possible

Thanks for your kind cooperation

Annex (5): Helsinki committee



اللجنة الفلسطينية للبحوث الصحية
Palestinian Health Research Council

تطوير القطاع الصحي الفلسطيني من خلال تنمية مصادر المعرفة الصحية في مجال البحث
Developing the Palestinian health sector through strengthening the use of information in decision making

Helsinki Committee
For Ethical Approval

Date: 10/08/2020 Number: PHRC/HC/74220
Name: Aisha H. Alqha

We would like to inform you that the committee had discussed the proposal of your study about
فقدتم اجراء مناقشة لطلبكم مقترح بحثكم حول

Pregnant Women's Knowledge and Awareness about the Role of Folic Acid in Preventing Neural Tube Defects at Governmental Primary Health Care Centers in Gaza Strip

The committee has decided to approve the above mentioned research. Approva number PHRC/HC/74220 in its meeting on 10/08/2020
و قد تمت الموافقة على البحث المذكور عليه بتاريخ والتوقيع المذكور عليه

Signature

Member
10/8/2020

Member
10/8/2020

General Conditions:-
1. Valid for 2 years from the date of approval
2. It is responsible to notify the committee of any change in the approved study protocol
3. The committee appreciation, ensuring a copy of your final research when completed


Special Conditions:-
Nawar A. Al-Qhah
10/8/2020

E-Mail: ad.phrc@gmail.com

Gaza - Palestine غزة - فلسطين
شارع النصر - مقرق العيون

Annex (6): MoH admin approval

State of Palestine
Ministry of health



دولة فلسطين
وزارة الصحة

التاريخ: 16/08/2021
رقم المراسلة: 747710

السيد : رامي عبد العبادله المحترم

مدير عام الوزارة /الإدارة العامة لتنمية القوى البشرية/وزارة الصحة

السلام عليكم ...

الموضوع/ تسهيل مهمة الباحثة/ عايشه الأها

التفاصيل //

بخصوص الموضوع أعلاه، برجي تسهيل مهمة الباحثة/ عايشه حمدان الأها
الملتحقه ببرنامج ماجستير تمريض صحة الأم والطفل - كلية المهن الصحية - جامعة القدس أبو ديس بغزة في إجراء
بحث بعنوان:


**"Pregnant Women's Knowledge and Awareness about the Role
of Folic Acid in Preventing Neural Tube Defects at
Governmental Primary Health Care Centers in Gaza Strip**

حيث الباحثة بحاجة لتعبئة استبانة من عدد من السيدات الحوامل المتربدات على مراكز الرعاية الصحية الأولية في قطاع
غزة (شهداء الرمال- شهداء خان يونس- مركز عيسان الصغيرة- عيسان الكبيرة- مركز دير الطيح- مركز القرارة-
مركز بني سهيل).

نأمل توجيهاتكم لتقوي الاختصاص بضرورة الحصول على الموافقة المستنيرة من السيدات اللواتي هم على استعداد
 للمشاركة في البحث ومن ثم تمكين الباحثة من التواصل معهم، ووفق الاصول المعمول بها، بما لا يتعارض مع مصلحة
 العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسؤولية..
وتفضلوا بقبول التحية والتقدير،
ملاحظة /

1- تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 6 أشهر من تاريخه.

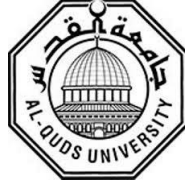
محمد إبراهيم السرساوي
مدير دائرة/الإدارة العامة لتنمية القوى البشرية



التحويلات

إجرائاتكم بالشخص (16/08/2021)	← رامي عبد سليمان العبادله (مدير عام الوزارة)	• محمد إبراهيم محمد السرساوي (مدير دائرة)
إجرائاتكم بالشخص (16/08/2021)	← ماهر محمود عبد الهادي شامية (مدير عام الوزارة)	• رامي عبد سليمان العبادله (مدير عام الوزارة)
لعمل اللازم (17/08/2021)	← موسى رجب حمدان عايشه (طبيب- بشري أخصائي)	• ماهر محمود عبد الهادي شامية (مدير عام الوزارة)
للإفادة (19/08/2021)	← خليل محمد محمود ضيام (مدير دائرة)	• موسى رجب حمدان عايشه (طبيب- بشري أخصائي)
للإفادة (19/08/2021)	← نعم جري محمد صفر (مدير دائرة)	• موسى رجب حمدان عايشه (طبيب- بشري أخصائي)

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عزيزتي المشاركة

يسعدني مشاركتك الفاعلة في بحث بعنوان

Pregnant Women's Knowledge and Awareness about the Role of Folic Acid in Preventing Neural Tube Defects at Governmental Primary

Health Care Centers in the Gaza Strip

“معرفة المرأة الحامل ووعيتها بدور حمض الفوليك في الوقاية من عيوب الأنبوب العصبي في مراكز الرعاية الصحية الأولية الحكومية في قطاع غزة”

إن هذا البحث يشكل جزء ضروري من دراستي للحصول على درجة الماجستير في المهن الصحية مسار صحة الام والطفل- كلية المهن الصحية بجامعة القدس- القدس (أبوديس).

وقد تم اختيارك ضمن مجموعة متلقين خدمات رعاية الحوامل في العيادات الحكومية للإجابة على العبارات الواردة فيها.

إذا كنت موافقة على المشاركة في هذه الدراسة، يرجى التكرم بقراءة العبارات التالية بدقة والإجابة عنها بموضوعية لما في ذلك من أثر كبير على صحة النتائج والتوصيات التي سوف تتوصل إليها الباحثة. مع التأكيد بأن هذه البيانات سوف تستخدم لأغراض البحث العلمي فقط، وسيتم التعامل معها بسرية تامة.

ملاحظة / الوقت اللازم لتعبئة الاستبانة كاملة يستغرق 10 دقائق فقط.

أشكرك على حسن تعاونك

المشرف

د. أحمد نجم

الباحثة

عائشة الأغا

Annex (8): List of experts

No.	Name	Affiliation
1	Dr. Hamza Abdeljawad	Al-Quds University
2	Ali Alkhateeb	Deanship of Nursing college in Applied
3	Dr. Amed Shaer	Islamic University
4	Dr. Yousef Awad	Palestine University
5	Dr. Hatem El-Dabbakeh	Ministry of Health

عنوان الدراسة: "معرفة المرأة الحامل ووعيها بدور حمض الفوليك في الوقاية من عيوب الأنبوب العصبي في مراكز الرعاية الصحية الأولية الحكومية في قطاع غزة".

إعداد الباحثة: عايشة حمدان نايف الأغا

إشراف: د. أحمد نجم

ملخص الدراسة:

الخلفية: يعد نقص حمض الفوليك حاليًا أحد أكثر حالات نقص الفيتامينات شيوعًا بين النساء. يزيد انخفاض تناول حمض الفوليك أثناء الحمل من احتمالية حدوث نتائج حمل غير مرغوب بها، بما في ذلك العديد من العيوب الخلقية.

الهدف: هدفت الدراسة إلى تقييم معرفة النساء الحوامل ووعيهن بدور حمض الفوليك في الوقاية من عيوب الأنبوب العصبي في مراكز الرعاية الصحية الأولية الحكومية في قطاع غزة.

الطريقة والمواد: تم استخدام تصميم وصفي شامل وتم استخلاص عينة متناسبة من المستجيبات الذين حضروا المراكز الحكومية السبعة التي تقدم خدمات الرعاية السابقة للولادة في المحافظات الخمس. كان حجم العينة 375 امرأة حامل يزورن خدمة رعاية الحمل خلال فترة الدراسة. تمت مقابلة النساء المستهدفات باستخدام استبيان مقابلة، وأجريت دراسة استطلاعية واستمرت الدراسة من يونيو 2021 إلى نوفمبر 2022. كانت موثوقية ألفا كرونباخ 0.815، وتم ضمان صلاحية الاستبيان من قبل الخبراء في هذا المجال. تم النظر في جميع القضايا الأخلاقية خلال جميع أجزاء الدراسة وتم استخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية، الإصدار 25 لتحليل البيانات.

النتائج: شاركت في الدراسة ثلاثمائة وخمس وسبعون امرأة حامل. تسكن غالبية النساء في هذه الدراسة في مدينة خنيونس (66.6%). من بين 375 امرأة، (81.6%) كانوا عاطلين عن العمل، و (74.6%) كان لديهم دخل أقل من 1973 شيكل إسرائيلي. 10.2% من النساء الحوامل غير مدركين لأهمية حمض الفوليك في الوقاية من الأمراض غير المعدية، 59.6% لديهم معرفة ضعيفة، 15.2% و 15% لديهم معرفة متوسطة وعالية، على التوالي. كانت معظم النساء (66%) يجهلن دور حمض الفوليك في منع الأمراض غير المعدية. كان أربعة أشخاص على دراية تامة. سمعت معظم النساء عن حمض الفوليك ونصفهن يعرفن فوائده، لكن أقل من ربعهن يعرفن أنه يمكن أن يمنع مرض عيوب الأنبوب العصبي وفقر الدم. فقط 22% من النساء تناولن حمض الفوليك قبل الحمل. يظهر الانحدار العادي اثنين من المتنبئين الذين يمكنهم التنبؤ بالمعرفة. أولاً: حالة التوظيف (نسبة الأرجحية = 1.071، مستوى الدلالة 0.003) من حيث أن التوظيف يزيد من مستوى معرفة المرأة بدور حمض الفوليك في منع الأمراض غير المعدية عن طريق 1.071. ثانياً: إنجاب طفل مصاب بأمراض غير معدية يتنبأ بالمعرفة (نسبة الأرجحية = 1.394، مستوى الدلالة 0.001) وذلك المرأة التي لديها طفل مصاب بأمراض غير معدية لديها معرفة أكبر بمقدار 1.39 أكثر من تلك التي لم تحصل عليها. وحده الوضع الوظيفي هو الذي يمكن أن يتنبأ بوعي المرأة (نسبة الأرجحية = 0.748، مستوى الدلالة 0.043) من حيث أن التوظيف يخفض مستوى وعي المرأة بمقدار 0.252.

الاستنتاج والتوصيات: أقل من ربع النساء يعرفن أنه يمكن الوقاية من عيوب الأنبوب العصبي وفقر الدم عن طريق تناول مكملات حمض الفوليك. توصي الدراسة بزيادة مستوى معرفة المرأة بفوائد مكملات حمض الفوليك من خلال إجراء جلسات تعليمية تستهدف أي امرأة تزور مراكز الرعاية الصحية الأولية لأي سبب من الأسباب. يجب تشجيع النساء من قبل مقدمي الرعاية الصحية على تناول مكملات حمض الفوليك قبل الحمل والتركيز على الأطعمة الصحية في نظامهن الغذائي.