ENSIGN GLOBAL COLLEGE, KPONG

EASTERN REGION, GHANA

FACULTY OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

KNOWLEDGE AND PRACTICES REGARDING IODIZED SALT UTILIZATION AMONGST PREGNANT WOMEN AT THE GA EAST MUNICIPALITY IN THE GREATER ACCRA REGION OF GHANA

BY

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SEPTEMBER, 2024

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A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, FACULTY OF PUBLIC HEALTH, ENSIGN GLOBAL COLLEGE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

MASTER OF PUBLIC HEALTH DEGREE

SEPTEMBER, 2024

DECLARATION

I hereby certify that except for references to other people's work, which I have duly cited, this project submitted to the Department of Community Health, Ensign Global College, Kpong, is the result of my own investigation and has not been presented for any other degree elsewhere.

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(Certified by)		
DR. STEPHEN MANORTEY	……	……
(Supervisor)	Signature	Date

(Certified by)		
DR. STEPHEN MANORTEY	……	…….
(Head of Academic Program)	Signature	Date

DEDICATION

To my loving parents, your constant encouragement and belief in me fueled my determination to complete this course. To my esteemed advisor, Dr. Stephen Manortey, thank you for your unwavering guidance and support throughout this journey.

ACKNOWLEDGEMENT

I deeply thank my supervisor, Dr. Stephen Manortey, for his unwavering support and insightful critiques throughout my research journey. My candid appreciation also goes to all faculty who contributed to teaching the prerequisite course, Research Design and Methodology. The knowledge and skill set earned is unparalleled.

To all the health facilities and participants who consented to this study, friends and families who contributed meaningfully in diverse ways, your efforts are undoubtedly appreciated

DEFINITION OF TERMS

TERM	DEFINITION
Iodized salt	Iodized salt is table salt that has been enhanced with iodine (20–40 mg/kg of salt), a critical micronutrient required for the synthesis of thyroid hormones.
Iodine deficiency	When iodine consumption is inadequate to meet the body's requirements—particularly for the synthesis of thyroid hormones—iodine insufficiency results.
Iodine deficiency disorder	The term "iodine deficiency disorder" (IDD) describes a range of health issues attributed to insufficient iodine levels in the body. .
Urinary Iodine Concentration	Urinary iodine concentration is a widely used biomarker to determine the iodine status of an individual or population. As urine is the primary means of excreting excess dietary iodine, it represents the amount of iodine consumed recently. The indicator utilized is the median urine iodine concentration; a level within the range of 100-199 µg/L signifies an acceptable iodine intake for the population, whereas levels below this range indicate an insufficient intake and possible risk for IDD.
Pregnant woman	A person who is carrying one or more embryos or fetuses inside her uterus during the gestational period—which usually lasts for around 40 weeks after the last menstrual period—is said to be pregnant.

LIST OF ABBREVIATIONS

Abbreviation	Meaning
CHPS	Community-Based Health Planning and Services
CI	Confidence Interval
GAEC	Ghana Atomic Energy Commission
GHS	Ghana Health Service
ICCIDD	International Council for the Control of IDD
IDD	Iodine deficiency disorder
IQ	Intelligent Quotient
KAP	Knowledge Attitude and Practice
LI	Legislative Instrument
MMDAs	Metropolitant, Municipal District Assemblies
NGOs	Non-Governmental Organizations
OPD	Out Patient Department
RR	Relative Risk
SD	Standard Deviation
SID	Severe Iodine Deficiency
UIC	Urinary Iodine Concentration
UK	United Kingdom
UNICEF	United Nations International Children's Fund
USI	Universal Salt Iodization
WHO	World Health Organization

ABSTRACT

Background: Pregnant women are particularly susceptible to iodine deficiency due to the fetus's greater need for iodine, and increased renal excretion of iodine during pregnancy. Severe iodine deficiency presents as goiter (maternal hypothyroidism), and neurological issues, such as mental retardation and neurological cretinism (deafness, mutism, squint, and mental deficiency), which irreversibly damage the fetus, resulting in a lower intellectual quotient and reduced learning capacity in the developing child. This study aimed to assess the level of awareness and practices regarding iodized salt utilization among pregnant women at the Ga East Municipality in the Greater Accra Region of Ghana. Additionally, the study sought to identify challenges faced in accessing and utilizing iodized salt and propose practical interventions to mitigate this public health issue.

Methodology: The study utilized a cross-sectional survey approach among pregnant women attending antenatal care at Ga East Municipality. A multi-stage sampling technique was employed and quantitative data was collected using a structured questionnaire. Data was analyzed using STATA analytic software (*StataCorp. 2007. Stata Statistical Software. Release 18. StatCorp LP, College Station TX, USA)*

Results: This study involved a total of 394 pregnant women with a 93.4 % response rate. The mean age of the participants was 30.19 (± 4.99). From the study, 42.9% of respondents had a high level of knowledge regarding the utilization of iodized salt. Additionally, 64.7% of respondents demonstrated good practices in using iodized salt. The analysis also showed that education ($p<0.001$) is statistically associated with knowledge of iodized salt among pregnant women. Conversely, Income ($p = 0.168$), Trimester ($p = 0.514$), Number of Children ($p = 0.611$), Religion ($p = 0.158$), and Residence ($p = 0.58$) are not significantly associated with knowledge or level of

awareness of iodized salt utilization. Again, the study highlighted challenges such as financial constraints, limited availability, family preferences, and cultural beliefs as significant barriers to the consistent use of iodized salt and also the association between knowledge and practice, thus, Knowledge ($p< 0.232$) was not significantly associated with practices regarding iodized salt utilization.

Conclusion: In conclusion, the findings of this study provide insights into the awareness, practices, facilitators, and challenges related to iodized salt utilization among pregnant women. The study found that 42.9% of respondents had a high level of knowledge regarding the utilization of iodized salt, and 64.7% of respondents demonstrated good practices in using iodized salt. However, challenges such as financial constraints, limited availability, family preferences, and cultural beliefs were identified as significant barriers to the consistent use of iodized salt. The Ghana Health Service and the Ministry of Health should implement a comprehensive public health education campaign focused on the benefits of iodized salt and addressing significant barriers to its utilization and access to knowledge related to iodized salt.

Keywords: Iodized salt, Pregnant women, Knowledge, Practices, Iodine deficiency, Iodine deficiency disorder.

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background to the study

Iodine is one of the vital nutrients for the human body and essential for brain development, thyroid function, and general health (Niwattisaiwong, S., Burman, K.D. and Li-Ng, M., 2017). Owing to the increased needs of the developing fetus, there is an increase in demand for iodine throughout pregnancy (Pearce, E.N., 2017). This means that to maintain normal thyroid function and support healthy brain and nervous system development in both the mother and the unborn child, a sufficient intake of iodine is required throughout pregnancy. Pregnant women should take 220 µg of iodine daily, which is more than the recommended quantity, as the growing fetus has higher demands than non-pregnant women (150 µg) (Businge, Longo-Mbenza and Kengne, 2021).

This extra iodine helps to produce thyroid hormones, which are important for the development of the embryonic brain, especially in the first trimester. A variety of food sources such as; milk, dairy, fish, eggs, and iodine-fortified foods and condiments, contribute to iodine intake in food, with iodized salt being the most common (Jar *et al.*, 2019; Bath *et al.*, 2022).

A fetus that consumes insufficient amounts of iodine during pregnancy may not produce enough thyroid hormones, a condition known as congenital hypothyroidism that can have a detrimental effect on brain development and cognitive function. This has been connected to children's lower IQs and decreased cognitive performance. If left untreated, a severe iodine deficit during pregnancy can result in goiter, or an enlarged thyroid gland, in both the mother and the unborn child, which can cause breathing and swallowing difficulties (Menon and Skeaff, 2017).

It is estimated that approximately 2 billion people worldwide are iodine deficient with children and lactating mothers being the most vulnerable population (Biban and Lichiardopol, 2017). A systematic review by Candido *et al*, (2019) found a high prevalence of insufficient iodine intake in pregnant women, with a deficiency ranging from 16.1% to 84.0% globally. The findings of Knight *et al.,* (2017) indicate an iodine deficit in pregnant women in South-West England providing substantial evidence for this public health issue.

Numerous researches have brought attention to pregnant women's poor iodized salt habits and awareness which may be a contributing factor to the high prevalence of iodine deficiency. In China, coastal women have been reported to have poor knowledge ratings and a higher likelihood of consuming non-iodized salt. Research carried out in sub-Saharan Africa has demonstrated that the use of non-iodized salt is problematic, particularly for disadvantaged, young, and pregnant women (Ba *et al.,* 2020). In Sri Lanka, 40% of pregnant women had inadequate understanding of iodized salt (De Zoysa *et al.*, 2015). Comparably, studies conducted in Ethiopia by Bazezew, Yallew, and Belew, (2018) discovered that knowledge and practices were inadequate. Only 41.9% of expecting mothers in Ethiopia utilize enough iodized salt even though it is widely available; factors impacting utilization include education, place of residence, mode of purchasing, and storage practices (Abera, 2021).

The most recent data from the Iodine Global Network (IGN) indicates that 85% of African countries' general populations appear to have adequate iodine nutrition (Businge, Longo-Mbenza, and Kengne, 2019; Businge *et al.,* 2022). However, 30% of these countries had more than 50% of the general population with a median urinary iodine concentration (UIC) < 100 μg/L when these numbers are further examined (Businge, Longo-Mbenza, and Kengne, 2019). Women of

reproductive age have a significant risk of having insufficient iodine intake at the beginning of pregnancy, given that a median UIC of 150–249 μg/L is deemed an acceptable iodine nutrition status during pregnancy (Kubuga, Abizari, and Song, 2019). Due to the salt reduction policy, pregnant women in Johannesburg, South Africa, may be slightly iodine deficient (Siro *et al.*, 2022).

These results highlight the necessity of focused educational initiatives to create awareness of iodized salt utilization among pregnant women. Iodine insufficiency is common among pregnant women, with rates as high as 42.5%, according to several studies conducted in Ghana (Simpong *et al.*, 2016). A study conducted in a peri-urban setting in Ghana recorded 47.2% of iodine deficiency in pregnant women, a figure that increased to 60.8% at later stages of pregnancy (Simpong *et al.*, 2018). Although 59.3% of households had sufficient awareness of iodine, only 24.2% of their salt had adequate iodine levels, (Sarah *et al.*, 2016). Low levels of iodine in salt could be attributed to poor practices and manufacturer non-compliance. Interventions, however, have been demonstrated to increase iodine status in vulnerable populations. These include the provision of iodized salt and the consumption of iodine-rich meals (Kubuga, Abizari, and Song, 2019). According to these results, pregnant women in Ghana need focused interventions to address gaps in knowledge and improve practices regarding the use of iodized salt.

1.2 Problem Statement

A pregnant woman's iodine deficit may have a long-term impact on the child's physical and mental development (Pearce, Lazarus, Moreno-Reyes, and Zimmermann, 2016). This is because the fetal thyroid gland is still developing and depends only on the mother's iodine supply, it is especially important during the first trimester. According to studies, 60.8% of pregnant women in a rural community and 47.2% of pregnant women in a peri-urban context were iodine deficient (Simpong *et al.*, 2018). Although the universal salt iodization program was implemented in Ghana in 1994

and has since spread the benefits of using iodized salt, pregnant women in Ghana are not as likely to use it as they should, which contributes to a high prevalence of iodine insufficiency (Appiah, Fenu and Yankey, 2020). According to the 2010 population and housing census, the total household population of the Municipality stands at 144,863 with over 90% of the household population living in the peri-urban areas abandoning rural areas which poses stress on social amenities and health service delivery in the peri-urban communities. There is limited data on the level of awareness and associated practices regarding iodized salt utilization amongst pregnant women in the Ga East Municipality. However, its geographic orientation typically depicts a rural and peri-urban context. Evidence obtained from this study will greatly inform the development of targeted interventions to forestall iodine deficiency amongst pregnant women in rural and peri-urban settings

1.3 Rationale of the study

Research has indicated that expectant mothers may experience iodine deficiency diseases, making them an additional highly susceptible population. Pregnant women in Ghana frequently have iodine insufficiency, with rates as high as 60.8%, according to research (Simpong *et al.,* 2018). This is alarming since a lack of iodine can have detrimental effects on the health of both the mother and the fetus. The problem is aggravated by the fact that both women of childbearing age and medical experts are ignorant of the benefits of iodine (Kayes, Mullan, and Woodside, 2022). Given that dietary iodine intake is significantly correlated with iodine status, this ignorance could be a contributing factor to the high prevalence of iodine insufficiency (O'Kane *et al.,* 2016). The World Health Organization (WHO) and United Nations International Children's Fund (UNICEF) are two international health organizations that stress the significance of consuming iodized salt during pregnancy to prevent iodine deficiency and the difficulties that come with it. On the other hand,

no information is available regarding Ghanaian pregnant women's knowledge and practices regarding iodized salt utilization. It appears that immediate national action is needed to address iodine insufficiency in pregnant women due to the high prevalence of iodine shortage in this population. The Ghana Food and Drugs Authority's resumption of the universal salt iodization initiative on February 20, 2024, highlights the necessity of stepping up public education and iodized salt monitoring. To create educational programs that specifically target this vulnerable population, it is essential to identify specific gaps in pregnant women's knowledge and practices regarding the use of iodized salt.

1.4 Conceptual Framework

This study used the Knowledge, Attitudes, and Practices (KAP) model to examine pregnant women's knowledge, attitudes, and practices regarding iodized salt utilization. Knowledge, attitudes, and practices are critical components of behavioral change models. Knowledge is the understanding of the information, which is the conscious and non-symbolic perception of meaning. According to Hulme, (2018), there are four categories of knowledge:

(i) scientific and social scientific knowledge;

(ii) local knowledge;

(iii) tacit knowledge; and

(iv) self-reflective knowledge.

Attitude refers to a positive or negative evaluation of an objective. Practice refers to regular activities that are influenced by widely shared social norms and beliefs.

The KAP model process originated from the learning theory by Albert Bandura (1975) and the diffusion of innovation theory by Roger (1995). According to Roger, members of a social system accept innovation through four stages over time. The stages include knowledge acquisition,

persuasion, decision, and confirmation. In addition, Albert Bandura suggested that individual behaviors are learned through social context. The Sociodemographic characteristics of an individual greatly impact their knowledge and attitude about iodized salt and consequently practices regarding its utilization.

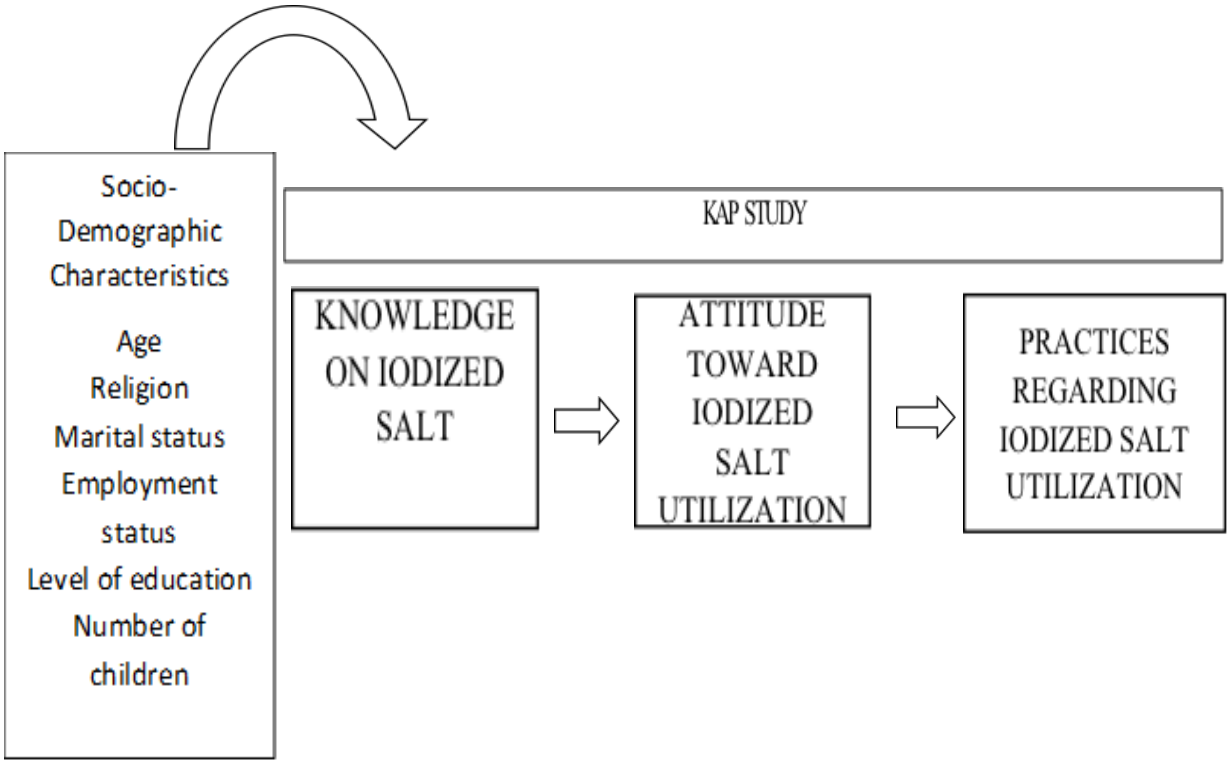

Figure. 1: A conceptual framework on KAP of iodized salt utilization.
Source: Albert Bandura (1975), Roger (1995).

1.5 Research Questions

1. What is the level of awareness regarding Iodized salt utilization amongst pregnant women in the Ga East Municipality?
2. What are the practices associated with iodized salt utilization amongst pregnant women in the Ga East Municipality?
3. What are the barriers or challenges faced in accessing or utilizing iodized salt amongst

pregnant women in the Ga East Municipality?

1.6 General Objectives

To assess the knowledge level and practices regarding iodized salt utilization amongst pregnant women at the Ga East Municipality in the Greater Accra Region of Ghana.

1.7 Specific Objectives

1. To assess the level of awareness on the utilization of iodized salt amongst pregnant women in the Ga East Municipality.
2. To determine the current practices regarding iodized salt utilization amongst pregnant women in the Ga East Municipality.
3. To identify challenges encountered in accessing and utilizing iodized salt amongst pregnant women in the Ga East Municipality.

1.8 Profile of the Study Area

Located in the Greater Accra Region, the Ga East Municipality is one of Ghana's 261 Metropolitan, Municipal, and District Assemblies (MMDAs). Legislative Instrument (LI) 1926, which was passed in 2012, established the municipality. Based on the Ghana Statistical Service's 2021 population forecast, the municipality has a total land area of roughly 66 square kilometers and a population of approximately 174,819. The Adenta Municipal Assembly borders the Ga East Municipality on the north; La-Nkwantanang-Madina Municipal Assembly borders it on the east; Accra Metropolitan Assembly borders it on the west; and Tema Metropolitan Assembly borders it on the south. Six (6) sub-municipalities comprise the municipality: Dome-Kwabenya, Abokobi-Ayawaso, Madina-Adentan, Ashongman Estates, Haatso-Taifa, and Okponglo. To meet the requirements of its residents, the Ga East Municipality has several health facilities, including

hospitals, clinics, and Community-Based Health Planning and Services (CHPS) compounds, in addition to several educational institutions which include; basic, secondary, and tertiary institutions.

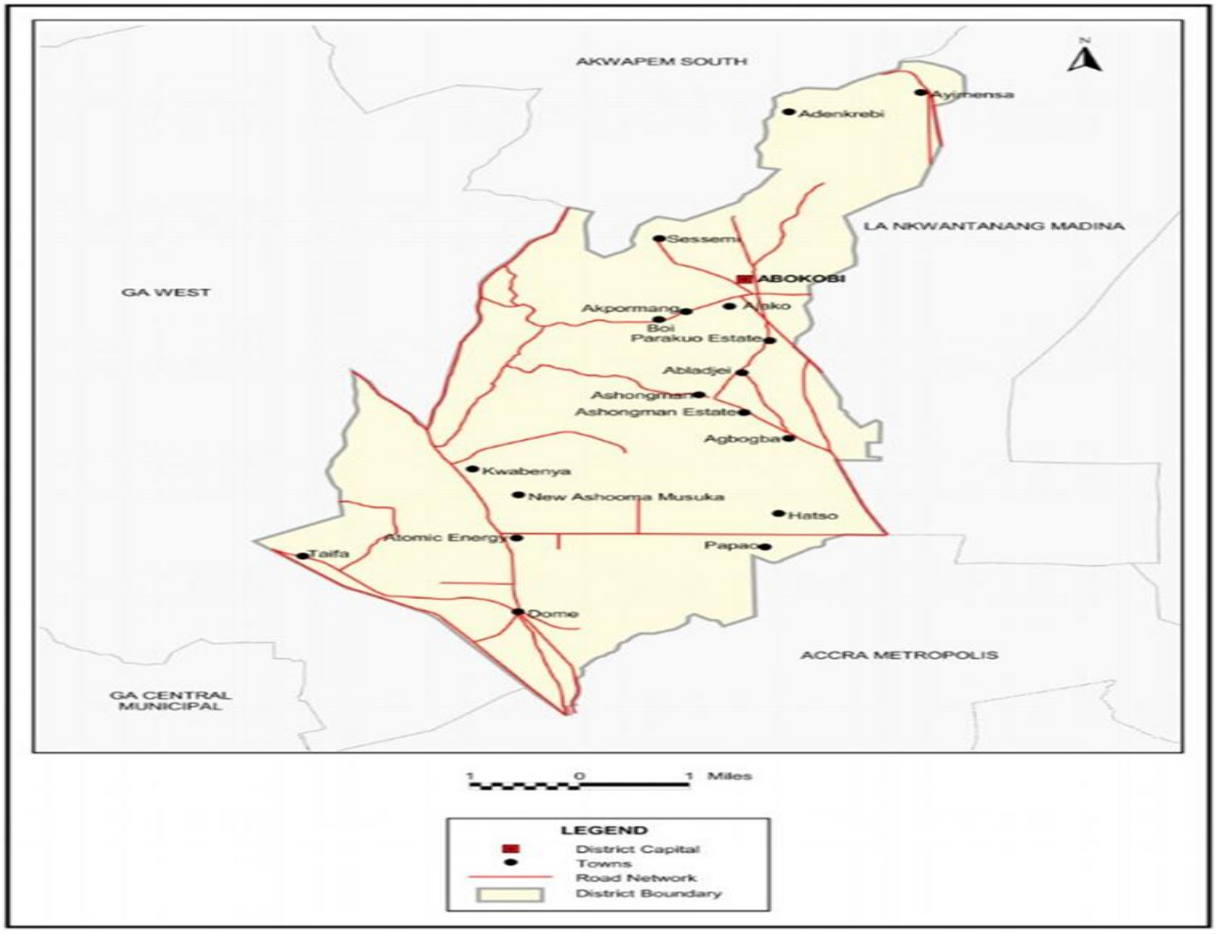

Figure 2: Map of Ga East Municipal
Source: Ghana Statistical Service

1.9 Scope of Study

This study is focused on knowledge level and practices regarding iodized salt utilization amongst pregnant women at the Ga East Municipality in the Greater Accra Region of Ghana. A total of 422 consented respondents were recruited into the study where a structured questionnaire was used as means of data collection.

1.10 Organization of Report

The study was organized into six (6) main chapters: Introduction, Literature Review, Methodology, Results, Discussions, Conclusions and Recommendations. Chapter one introduced the background information of the study: the problem statement, the rationale of the study, the conceptual framework, the research questions, the general objective, the specific objectives and the scope of the study. Chapter Two which is the literature review presented similar studies associated with the objectives of the study. Chapter Three outlined the methodology which comprised the study area, the research methods and design, data collection techniques and tools, study population, study variables, sampling, pre-testing, data handling, data analysis, ethical considerations, and limitations of the study. Chapter Four, the results section, provided a summary of the variables as well as the results based on the key variables of the study from data analysis. These results are represented in tables. Chapter Five discussed the results based on the research questions by comparing them with the literature. Finally, Chapter Six outlined the conclusion and recommendations of the study.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

This study chapter elaborates and reviews the relevant literature on knowledge and practices regarding iodized salt utilization among pregnant women at the Ga East Municipality in the Greater Accra Region of Ghana. It defines key concepts and an evaluation of other studies concerning the research problem being studied.

2.2 Universal Salt Iodization

To address the insufficiency of iodine in the environment, universal salt iodization (USI), which is the preferred technique for reducing iodine deficiency, calls for iodizing all food-grade salt, including industry and household salt (Abu, Oldewage-Theron, and Aryeetey, 2019).

A database maintained by the Iodine Global Network (IGN) shows that 129 out of 197 countries have mandatory legislation for the iodization of at least household/table salt or salt for food processing The United Nations Children's Fund (UNICEF) estimates that over 140 countries are implementing salt iodization programs (Abizari, Dold, Kupka, and Zimmermann, 2017).

Iodized salt is used in 75% of households globally, leading to a decline in the number of iodine-deficient nations from 110 in 1993 to 15 in 2016. However, iodine shortage is still common, especially throughout the course of pregnancy (Abu, Oldewage-Theron, and Aryeetey, 2019). A systematic analysis, according to Candido *et al.,* (2019) revealed that there is a high incidence of inadequate iodine consumption in pregnant women, with deficiency rates ranging from 16.1% to 84.0%. Pregnant women in South-West England have an iodine deficit, according to research by Knight *et al.,* (2017) found a significant frequency of iodine shortage in pregnant women living in

an area with acceptable iodine levels, offering strong evidence for this public health concern. Pregnant women in Johannesburg, South Africa, may be slightly iodine deficient as a result of the salt reduction strategy (Siro *et al.,* 2022). Iodine insufficiency in pregnant women was found in 47.2% of cases in a Ghanaian peri-urban study; this percentage rose to 60% in the later stages of pregnancy (Simpong *et al.,* 2018). Iodine deficiency disorder (IDD) is still a risk for pregnant women and their unborn infants, according to a study that looked at the UIC in pregnant women at Kissi, in Ghana's Central Region. The study revealed that 42.5% of pregnant women had iodine deficiency (Simpong *et al.,* 2018). IDD was first noted in Ghana in 1994, according to a survey that projected 33% of Ghanaians to have the disorder (Abizari, Dold, Kupka, and Zimmermann, 2017). To lessen IDD and its effects, a nationwide salt iodization program was put into place in 1996; at the point of production, the iodized salt standard for this program was set at 50 parts per million (ppm) of potassium iodate (KIO3) (Appiah, Fenu, and Yankey, 2020).

Transportation losses were anticipated to result in a point-of-use iodine concentration in salt of at least 15 parts per million. Since the salt fortification program was implemented, 80% of households have been using iodized salt according to a 2007 survey conducted in two sentinel districts (Jirapa and Bongo); however, only 36.5% and 36.3%, of household salt were sufficiently iodized, respectively. Between 1994 and 2007, the prevalence of goiter likewise decreased, going from 56.4% to 10.6% in the Jirapa District and from 56.5% to 18.2% in the Bongo District (Dongzagla, Jewitt, and O'Hara, 2019).

Ghana has ongoing national projects to address additional micronutrient deficiencies, such as fortifying wheat flour with zinc, iron, vitamin A, and folic acid, and oil with vitamin A. Organizations like the World Health Organization (WHO), UNICEF, and IGN (formerly known as the International Council for the Control of IDD (ICCIDD)) recommend salt iodization for the

following reasons: I. salt is consumed widely by almost all population groups in all countries, with little seasonal variation in consumption; (ii) salt production is typically limited to a few centers, facilitating quality control; (iii) salt iodization technology is well-established and relatively easy to transfer to less developed countries; (iv) Because iodization does not affect the organoleptic properties of salt, consumer acceptability is high, and (v) the cost of iodization is relatively low. Iodized salt significantly lowers the risk of goiter, cretinism, impaired cognitive function, and iodine insufficiency, according to a review on the safety and effects of salt iodization that was commissioned by the World Health Organization. One of the most economical nutrition interventions is salt iodization, with an estimated benefit: cost ratio of 30:1, from increased economic productivity resulting from the prevention of cognitive deficits in offspring born to mothers who would have otherwise developed subclinical iodine deficiency or goiter. (UNICEF, 2017; Santos *et al.*, 2019).

2.3 Iodine Deficiency Disorder

The thyroid gland requires iodine to operate properly, which is why it is a vitamin that is especially important during pregnancy when the fetal brain is developing and needs more iodine. Birth defects, intellectual disability, and developmental delays in offspring are among the negative consequences of iodine shortage during pregnancy (Pearce, Lazarus, Moreno-Reyes, and Zimmermann, 2016). World Health Organization (WHO) recommended test for determining iodine intake status in populations is the median urine iodine concentration (UIC). Urine Iodine Content (UIC) is a great indicator of recent iodine intake because more than 90% of iodine consumed is eliminated through the urine (Businge, Longo-Mbenza, and Kengne, 2021). Those who are severely iodine deficient (SID) have a median UIC of less than 20 μg/L for school-age

children, and those who have values between 20 and 99 μg/L for mildly iodine deficient populations Variations in body size, urine volumes, renal function (glomerular filtrate rate), and iodine requirements during pregnancy could be the cause of this variation (Pearce, Lazarus, Moreno-Reyes, and Zimmermann, 2016). At a WHO Technical Consultation in 2007, a committee resolution or consensus resulted in the establishment of an updated epidemiological criterion for the iodine consumption status of pregnant women. This new criterion states that a population median UIC cut-off of less than 150 μg/L should be used to indicate iodine insufficiency in any trimester of pregnancy. This threshold denotes the higher iodine requirements and consumption guidelines for pregnant women, with a 50 μg/L rise above the median UIC threshold for adults and children of school age (Toloza, Motahari, and Maraka, 2020). However, there are currently no suggested thresholds for the degree of iodine deficiency during pregnancy (Stinca, *et al.,* 2017).

An estimated 241 million children worldwide (or 29.8% of school-age children) do not get enough iodine from their diets. Of the 241 million kids, 76 million are from the WHO's South East Asia region, and 58 million are from Africa (Pearce, 2017; Farebrother *et al.*, 2018). IDD, which results from inadequate thyroid hormone synthesis, has several detrimental health impacts.

Anthropometric measurements, thyroid function, nutritional condition, and mortality are all impacted by SID and its treatment. When 295 pregnant women in a severely iodine-deficient area of western China were given supplements, the risk of microcephaly decreased from 27 to 11 percent ($p = 0.006$) and the circumference of the skull increased (Harding *et al.,* 2017). A large Asian study found that using iodized salt during pregnancy was associated with higher birth weight and a larger circumference around the mid-upper arm. Nonetheless, it's plausible that pregnant women who consumed enough iodine had higher nutritional and socioeconomic standing, which could have improved the anthropometric indices of their progeny (Öksüz, Alkan, Taşkın, and

Ayrancı, 2018). Thyroid sizes were 40 percent bigger in babies from non-supplemented moms than in newborns from iodine-supplemented mothers, according to ultrasonographic measures of thyroid volume in neonates. The survival rates of newborns and infants born to mothers who had their iodine deficit treated before or during pregnancy showed improvements. In three SID-affected districts in China, Kayes, Mullan, and Woodside, (2022) supplied potassium iodate to irrigation water and discovered a noteworthy decrease in newborn and infant mortality in these areas after two to three years when compared to areas that did not get iodine. When iodized oil was given intramuscularly to pregnant women in Zaire who were severely deficient in iodine at 28 weeks of gestation, the infant death rate was considerably lower than in the untreated group (113/1000 vs. 243/1000).

Due to the potential for irreparable brain damage during critical brain development phases, any degree of thyroid hormone deficiency might result in neurocognitive delay and neurological abnormalities in the progeny. How soon and how severe the hypothyroxinemia is will determine how serious these effects are. Creatinine deficiency in utero takes two forms: neurological and myxedematous (hypothyroid), and cretinism is the most severe manifestation (Velasco, Bath, and Rayman, 2018). A kid with cretinism is born to 4–10% of pregnant women who are severely low in iodine (Ullah *et al.*, 2019). The most prevalent type of cretinism is neurological, with neurocognitive delay, reduced voluntary motor activity (spastic diplegia or paresis of the lower limbs), squinting, hearing and speech abnormalities (deaf-muteness of varied degrees), and posture difficulties as clinical characteristics (Ullah *et al.*, 2019).

Severe or chronic hypothyroidism with the following symptoms: myxedema, dwarfism, delayed body part maturation, skeletal retardation, dry, thickened skin, sparse hair and nails, sexual

retardation, deep hoarse voice, delayed tendon reflexes, and impaired bowel function are the hallmarks of myxedematous cretinism (Ullah *et al.,* 2019). In children with myxedematous cretinism, goiter may be predicted to some extent, but thyroid atrophy seems to be a prevalent finding instead. While the clinical manifestations of these kinds of cretinism differ, there are neurological similarities between them, such as cognition delay, deafness, pyramidal/extrapyramidal dysfunction, and primitive reflexes (Velasco, Bath, and Rayman, 2018). Thus, it is possible that the two types of cretinism are related to a range of widespread insults to the developing fetal neurological system, wherein the typical signs of myxedematous cretinism may be caused by a postnatal thyroid hormone deficit. The groundbreaking studies of iodine replacement during pregnancy in SID-affected areas in Papua New Guinea and Zaire provide evidence connecting SID to cretinism. These trials showed that iodine supplementation with iodized oil was linked to higher psychomotor development scores at 72 months in the offspring of iodine-treated mothers (91 ± 13 vs. 82), as well as a significant decrease in the prevalence of endemic cretinism at 4 years [RR = 0.27; 95% CI 0.12–0.60] and at 10 years of age [RR = 0.17; 95% CI 0.05, 0.58] (Farebrother *et al.,* 2018). Maternal and fetal health depends on having an adequate iodine status. Adverse effects on the mother, fetus, and progeny are permanent when severe iodine shortage (SID) occurs during pregnancy. Supplementation even prior to conception is advised due to the elevated need for iodine consumption during pregnancy.

2.4 Knowledge of Iodized Salt Utilization among Pregnant Women

Numerous investigations have evaluated expectant mothers' awareness of the use of iodized salt. According to research by Kayes, Mullan, and Woodside, (2022), a sizable percentage of expectant mothers were ignorant of the value of iodized salt in fulfilling their iodine needs during pregnancy. Similar to this, a study by Haji, Abdurahmen, and Paulos, (2017) found that pregnant women were

unaware of the advantages iodized salt consumption has on both their own and their unborn child's health.

Pregnant women's awareness of using iodized salt has been evaluated in multiple research. These results underline the necessity of focused education and awareness campaigns to increase pregnant women's understanding of iodized salt. A study conducted on 360 patients visiting the obstetric Outpatient Department (OPD) at a public sector tertiary care hospital in Karachi reported that 82.5% of respondents (n=297) were unaware of the definition of iodine. Of the responders, 229 out of 360 (63.6%) had heard of iodized salt. Also, 40.6% obtained knowledge about iodized salt via the media. Of those surveyed, almost 90.8% (n=327/360) were unaware of the effects of iodine shortage on infants, kids, and adults (Shaikh, Mumtaz, and Shaikh, 2022).

Based on research by McMullan *et al.*, (2019) 74.1% of expectant mothers were unaware of iodine deficiency and related illnesses, 35.7% did not understand the value of protecting against iodine deficiency, 65.7% did not understand the need for iodized salt use during pregnancy, and 55.9% of the expectant mothers said they use iodized salt. 51% of pregnant women used iodized salt because it is healthier and more helpful. Pregnant women may avoid iodine deficit if they have a greater general understanding of iodine (O'Kane *et al.*, 2016). Pregnant women can receive valuable instruction about healthy nutrition and iodine consumption during pregnancy from health experts and pregnant school programs, which plays a unique role. One of the most significant dietary sources of iodine, according to 41.0% of pregnant women in a Norwegian study, is iodized salt; but most of the pregnant women in this study (77.3%) said that one of the best dietary iodine sources was table salt. A different study that assessed 520 women in the UK and Ireland who were of childbearing age found that nearly half (41.0%) of the participants were unable to correctly

identify any health issues related to iodine deficiency (O'Kane *et al.,* 2016). In a study conducted in Trabzon, Turkey, which is recognized as an endemic goiter region. Thus, it is possible to explain the participants' increased awareness of iodine deficiency-related diseases through their social connections, as some of their friends or family may have one of these conditions. The participants' mean iodine knowledge score was found to be low. The majority of the women taking part in Turkey's state hospitals' "Pregnancy School Project" are in the second trimester of their pregnancies and are more receptive to receiving dietary advice. According to this study, pregnant women who received nutrition education scored higher on iodine knowledge. However, 53% of the expectant mothers said they had never before gotten any nutritional instruction. Additionally, it was found in other research that pregnant women had greater nutritional sensitivity than non-pregnant women (Haji, Abdurahmen, and Paulos, 2017).

It was discovered that pregnant women in earlier research carried out in several parts of Turkey were not getting enough iodine. It has been found that greater iodine knowledge scores during pregnancy are correlated with higher levels of education. Therefore, it is recommended that pregnant women begin receiving specialized iodine instruction as early as possible in their pregnancies. While increasing understanding about iodine through pregnancy education is crucial, women's general education levels should also be considered. This study discovered that mean iodine knowledge scores rose together with participant education level ($p < 0.05$). Iodine knowledge ratings were found to be greater in participants with higher education levels in research conducted in Sri Lanka, the United Kingdom, and Norway (Katagiri, Yuan, Kobayashi, and Sasaki, 2017).

2.5 Practices Regarding Iodized Salt Utilization

The utilization of iodized salt among pregnant women varies across different regions and communities. A study conducted by Mehrotra, A., (2017) revealed that while the majority of pregnant women knew about iodized salt, actual consumption practices were suboptimal due to factors such as taste preferences, availability, and affordability. Iodized salt should be kept in a cool, dry environment without light and in dark-colored glass containers to prevent iodine loss (Abizari, Dold, Kupka, and Zimmermann,2017). In a study by Sarah *et al.*, (2016) 45.9% of pregnant women kept salt in a glass jar with a lid. While 71.6% of the pregnant women in the study of Hawas *et al., (*2016) kept salt in a glass jar, 76% of the pregnant women in the study of O'Kane *et al.,* (2016) kept salt in a cool, closed environment without any sunlight.

Also, according to Ullah *et al.*, (2019) 19.1% of the pregnant women and 13.9% of the pregnant women in the study of Mehrotra, (2017). stated that they were keeping salt in light-proof jars which are the ideal containers Iodine loss occurs in salts that are not kept under proper conditions, and it results in the problems associated with iodine deficiency even when iodized salt is used. Iodine is a substance that is affected by heat, moisture, and other climatic conditions. Since iodized salt loses approximately 50% of its content when cooked, it is recommended to add iodized salt after the meal is prepared (Hawas *et al.,* 2016). It has been reported that about 83.3% of pregnant women add salt to their meals during cooking. Of the pregnant women 91.5% in the study of O'Kane *et al.,* (2016) stated that they add salt to meals before starting to cook.

From these studies, it can be established that iodized salt is not added during the recommended times. Various barriers hinder the optimal utilization of iodized salt among pregnant women. Lack of awareness about the benefits of iodized salt, misconceptions about its safety, inadequate access

to iodized salt in remote areas, and affordability issues have been identified as key barriers (Vasudevan, Senthilvel, and Sureshbabu, 2019).

2.6 Facilitators And Challenges

Several factors, including government regulations, public awareness campaigns, accessibility, and community involvement, affect the use of iodized salt as a prophylactic against iodine deficiency (Ghimire, Shrestha, and Callahan, 2018). Cultural preferences, problems with quality control, economic obstacles, and shifting political will are some of the major difficulties it encounters (Bouga, Lean, and Combet, 2018). It is imperative to address these barriers while harnessing facilitators to improve public health outcomes related to iodine shortage.

Government initiatives greatly encourage the use of iodized salt. Numerous nations have passed legislation requiring iodine to be added to salt (Ezezika, Ragunathan, El-Bakri, and Barrett, 2021). For example, the availability and consumption of iodized salt have expanded dramatically across various demographics in India because of the Universal Salt Iodization program (Mkumbo et al., 2018). The use of iodized salt has increased as a result of educational programs that highlight the benefits of iodine for health. Research shows that populations are more inclined to utilize iodized salt if they are informed about iodine-deficient illnesses (Ansari, Khan, and Khan, 2020). These efforts generally entail collaboration between governments, NGOs, and health groups.

Another enabler is the presence of iodized salt in nearby markets. It has been demonstrated through research that iodized salt intake rises when it is easily accessible and reasonably priced (Webster et al., 2022). Its use has also been positively impacted by manufacturers' attempts to provide reasonably priced iodized salt. The adoption of iodized salt can be increased by community involvement in its promotion. Reducing dietary habits is typically more successful for programs

that involve local influencers or leaders (Lowe *et al.*,2015). Community engagement promotes a sense of ownership over health initiatives, which results in long-lasting behavior modification. Adoption of iodized salt may be hindered by cultural perspectives on eating habits. Some regions prefer traditional salts due to their flavor or cultural significance (Ansari et al., 2020). Overcoming these tendencies requires tailored

Iodization programs may be less effective if there is inadequate quality control throughout the production and distribution phases. Research shows that fluctuating levels of iodine in commercially accessible salts can result from insufficient monitoring (Webster et al., 2022). Quality assurance must be consistent to keep the public's trust in iodized products. A further problem is the influence of economic variables; low-income households may buy food items based more on cost than nutritional content (Ghimire, Shrestha, and Callahan, 2018). Despite possible health hazards, households may choose less expensive non-iodized salt if iodized salt is more expensive. Despite the government's initial strong backing, maintaining a political commitment to iodization projects over time can be difficult (Ezezika, Ragunathan, El-Bakri, and Barrett, 2021). Initiatives addressing iodine deficiency may receive less financing or attention as a result of changes in governmental priorities or leadership (Athavale,2020).

2.7 Conceptual Framework

The Knowledge, Attitude, and Practices (KAP) model provides an excellent framework for addressing the study objectives related to iodized salt utilization among pregnant women in the Ga East Municipality. The first objective aims to assess the level of awareness regarding iodized salt

utilization. This aligns directly with the knowledge component of the KAP model. According to Hulme (2018), knowledge can be categorized into different types:

2.7.1 Scientific Knowledge

Scientific knowledge encompasses the evidence-based understanding of iodine's role in foetal development and the prevention of iodine deficiency disorders. This knowledge is crucial for pregnant women to make informed decisions about their iodine intake. A comprehensive review by Zimmermann (2009) in The Lancet highlighted the critical role of iodine in foetal brain development. The study emphasized that severe iodine deficiency during pregnancy can lead to cretinism, while even mild-to-moderate deficiency can cause lower cognitive and motor performance in children.

Pearce *et al.,* (2013) in Nature Reviews Endocrinology further elaborated on the importance of iodine during pregnancy. They noted that iodine is essential for the production of thyroid hormones, which are critical for foetal brain development, especially during the first trimester.

Regarding the role of iodized salt, a study by Spohrer *et al.,* (2019) in Nutrients demonstrated that salt iodization programs have been highly effective in reducing iodine deficiency disorders globally. They emphasized the importance of continued education about iodized salt to maintain these gains.

Local knowledge

Local knowledge refers to community-specific beliefs and practices related to salt consumption during pregnancy. These beliefs can significantly influence iodized salt utilization. A qualitative study by Mkumbo *et al.,* (2018) in Tanzania explored local beliefs about salt consumption during pregnancy. They found that some communities believed that reducing salt intake during pregnancy

could prevent swelling and high blood pressure, potentially conflicting with recommendations for iodized salt consumption.

Similarly, Knowles *et al.,* (2017) conducted a study in Ghana that revealed local beliefs about the taste and effectiveness of iodized salt influenced its use. Some participants believed that iodized salt was less potent in food preparation, affecting their willingness to use it.

Tacit knowledge

Tacit knowledge refers to the intuitive understanding gained through experience or cultural transmission. This type of knowledge often influences behaviour without explicit awareness.

A study by Karmakar *et al.,* (2014) in rural Bangladesh explored how tacit knowledge influenced salt consumption practices. They found that traditional cooking methods and taste preferences, passed down through generations, significantly impacted the type and amount of salt used in food preparation. Lowe *et al.,* (2015) conducted research in Samoa that highlighted how tacit knowledge about food preparation and salt use was deeply ingrained in cultural practices, making it challenging to introduce new behaviours like using iodized salt.

Self-reflective knowledge

Self-reflective knowledge involves a woman's awareness of her own iodine intake habits and their potential impact on her pregnancy. A study by Charlton *et al.,* (2013) in Australia found that many pregnant women were unaware of their own iodine intake and its adequacy. This lack of self-reflective knowledge led to suboptimal iodine nutrition in many cases.

Similarly, Garnweidner-Holme *et al.,* (2017) conducted a study in Norway that revealed many pregnant women had low awareness of their own iodine status and intake. This lack of self-reflective knowledge was associated with inadequate iodine intake during pregnancy.

Understanding these different types of knowledge is crucial for developing effective interventions to promote iodized salt use among pregnant women. Scientific knowledge provides the foundation for understanding the importance of iodine, while local and tacit knowledge influence how this information is received and acted upon. Self-reflective knowledge is crucial for women to recognize their own needs and take appropriate action.

Interventions that address all these types of knowledge are likely to be more effective. For example, Ansari *et al.*, (2020) described a successful program in Pakistan that combined scientific education about iodine with efforts to address local beliefs and practices, resulting in improved iodized salt utilization among pregnant women. Assessing these different types of knowledge will provide a comprehensive picture of awareness levels among pregnant women in the Ga East Municipality.

2.7.2 Practices Component

The second objective focuses on determining current practices regarding iodized salt utilization. This aligns with the practices component of the KAP model. Bandura's Social Learning Theory (1975) suggests that practices are influenced by observational learning and social context. In this framework, we would examine:

Actual usage of iodized salt in daily cooking

The actual usage of iodized salt in daily cooking is a critical practice to examine. A study by Knowles *et al.,* (2017) across 10 countries found significant variations in household coverage of adequately iodized salt, ranging from 6.2% in Niger to 97.0% in Uganda. This highlights the

importance of assessing actual usage practices. Ansari *et al.,* (2020) conducted a community-based study in northern India, finding that while awareness of iodized salt was high (91.8%), only 71.1% of households were actually using adequately iodized salt. This discrepancy between knowledge and practice underscores the need to examine actual usage patterns.

Storage practices of iodized salt

Proper storage of iodized salt is crucial to maintain its iodine content. A study by Diosady *et al.,* (2018) in Food and Nutrition Bulletin emphasized that exposure to humidity, sunlight, and heat can significantly reduce the iodine content in salt. They found that storage in sealed containers and away from heat sources helped maintain iodine levels. Shawel *et al.,* (2010) conducted a study in Ethiopia that revealed poor storage practices, with only 26% of households storing salt in a covered container. This led to significant iodine losses, highlighting the importance of assessing and improving storage practices.

Purchasing behaviours related to iodized salt

Purchasing behaviours play a crucial role in ensuring the use of iodized salt. A study by Knowles *et al.,* (2017) found that socioeconomic status significantly influenced the likelihood of purchasing adequately iodized salt, with wealthier households more likely to have access to it. Tran *et al.,* (2018) conducted a study in Vietnam that revealed factors influencing purchasing behaviours, including price, availability, and perceived quality of iodized salt. They found that many consumers were unaware of how to identify iodized salt in the market, affecting their purchasing decisions.

Influence of family members and social networks on salt usage practices

Bandura's Social Learning Theory (1975) emphasizes the role of social context in shaping behaviours. This is particularly relevant in salt usage practices. A study by Mkumbo *et al.,* (2018)

in Tanzania found that household decision-making structures significantly influenced iodized salt use. They noted that in households where women had more decision-making power, the use of iodized salt was higher. Lowe *et al.,* (2015) conducted research in Pakistan that highlighted the importance of social networks in influencing salt usage practices. They found that community leaders and local health workers played a crucial role in promoting the use of iodized salt.

These studies collectively demonstrate the complex interplay of factors influencing iodized salt practices. Actual usage is often lower than expected based on awareness levels, highlighting the gap between knowledge and practice. Storage practices significantly impact the effectiveness of iodization programs, emphasizing the need for education on proper storage methods. Purchasing behaviours are influenced by socioeconomic factors and market availability, suggesting the need for broader policy interventions. Finally, the influence of family and social networks underscores the importance of community-based approaches in promoting iodized salt use.

Understanding these practices and their determinants is crucial for developing effective interventions. For instance, Ansari *et al.,* (2020) described a successful program that addressed multiple aspects of practices, including usage, storage, and social influences, resulting in improved iodized salt utilization among pregnant women.

2.7.3 Barriers and Facilitators

The third objective aims to identify challenges in accessing and utilizing iodized salt. While this is not explicitly part of the KAP model, it can be integrated by considering barriers and facilitators that influence both knowledge and practices. This aspect draws from Rogers' Diffusion of Innovation Theory (1995), which emphasizes factors that influence the adoption of new practices. Key elements to consider include:

Availability and accessibility of iodized salt in local markets*:*

The availability and accessibility of iodized salt in local markets is a crucial factor in its utilization. A study by Knowles *et al.,* (2018) across ten countries found significant variations in the availability of adequately iodized salt, ranging from 11.7% in Niger to 95.9% in Uganda. This highlights the importance of assessing local market conditions.

Ansari *et al.,* (2020) conducted a community-based study in northern India, finding that while iodized salt was available in most local markets, the quality and iodine content varied significantly. They emphasized the need for regular monitoring of salt iodization at the retail level to ensure consistent availability of adequately iodized salt.

Cost factors

Cost is a significant barrier to the adoption of iodized salt, particularly in low-income settings. A study by Knowles *et al.,* (2017) found that households in the lowest wealth quintile were significantly less likely to have access to adequately iodized salt compared to those in the highest wealth quintile across multiple countries. Tran *et al.,* (2018) conducted research in Vietnam that revealed price differentials between iodized and non-iodized salt as a major barrier to adoption. They found that even small price differences could significantly impact purchasing decisions, especially among low-income households.

Cultural or social barriers to iodized salt use

Cultural and social factors can significantly influence the adoption of iodized salt. A study by Mkumbo *et al.,* (2018) in Tanzania found that traditional beliefs about the medicinal properties of non-iodized salt were a barrier to iodized salt adoption in some communities.

Lowe *et al.,* (2015) conducted research in Pakistan that highlighted the role of gender dynamics in household decision-making as a potential barrier to iodized salt use. They found that in households where men made most purchasing decisions, there was lower adoption of iodized salt.

Misconceptions or negative attitudes towards iodized salt

Misconceptions and negative attitudes can significantly hinder the adoption of iodized salt. A study by Gidey *et al.,* (2018) in Ethiopia found that misconceptions about the taste and health effects of iodized salt were common barriers to its use. Some participants believed that iodized salt could cause infertility or had an unpleasant taste. Khan et al. (2019) conducted a study in Pakistan that revealed negative attitudes towards iodized salt stemming from misinformation spread through social media. They found that addressing these misconceptions through targeted education campaigns was crucial for improving iodized salt adoption.

These studies collectively demonstrate the complex interplay of factors influencing the adoption of iodized salt, aligning with Rogers' Diffusion of Innovation Theory (1995). Availability and accessibility issues highlight the need for robust supply chain management and quality control measures. Cost factors emphasize the importance of economic considerations in intervention design. Cultural and social barriers underscore the need for culturally sensitive approaches to promoting iodized salt use. Finally, addressing misconceptions and negative attitudes requires targeted education and awareness campaigns.

Understanding these challenges is crucial for developing effective interventions. For instance, Ansari *et al.,* (2020) described a successful program that addressed multiple barriers, including availability, cost, and misconceptions, resulting in improved iodized salt utilization among pregnant women.

Rogers' Diffusion of Innovation Theory (1995) provides a useful framework for understanding these challenges. The theory suggests that the adoption of innovations (in this case, iodized salt) is influenced by factors such as relative advantage, compatibility with existing values, complexity, trialability, and observability. By addressing the identified challenges through this lens, interventions can be designed to enhance the perceived benefits of iodized salt, ensure compatibility with local cultural practices, simplify its use, provide trial opportunities, and make the benefits more observable to potential adopters.

2.7.4 Sociodemographic Characteristics

While not a direct objective, sociodemographic factors play a crucial role in shaping knowledge, attitudes, and practices. These characteristics might include:

Age

Age has been found to influence knowledge and practices related to iodized salt use. A study by Harding *et al.,* (2017) in Ethiopia found that younger women (18-24 years) were less likely to have adequate knowledge about iodized salt compared to older women. This suggests that age-specific interventions may be necessary. Conversely, Pandav *et al.,* (2013) found in a study in India that older women were more likely to adhere to traditional practices and less likely to adopt iodized salt, highlighting the complex relationship between age and iodized salt use.

Education level

Education level has consistently been shown to impact knowledge and practices related to iodized salt. A comprehensive study by Knowles *et al.,* (2017) across ten countries found that women with higher education levels were more likely to use adequately iodized salt. Similarly, Gidey *et al.,*

(2018) found in Ethiopia that women with formal education were 2.07 times more likely to have adequate knowledge about iodized salt compared to those without formal education.

Socioeconomic status

Socioeconomic status significantly influences access to and use of iodized salt. Knowles *et al.,* (2017) found that households in the highest wealth quintile were up to 7 times more likely to use adequately iodized salt compared to those in the lowest quintile. A study by Ansari *et al.,* (2020) in India found that women from higher socioeconomic backgrounds had better knowledge and practices regarding iodized salt use, emphasizing the need for targeted interventions for lower socioeconomic groups.

Cultural background

Cultural background plays a crucial role in shaping attitudes and practices towards iodized salt. Lowe *et al.,* (2015) conducted research in Pakistan that highlighted how cultural beliefs about traditional salt types influenced iodized salt adoption. Mkumbo *et al.,* (2018) found in Tanzania that certain cultural practices, such as using specific types of salt for ritual purposes, could act as barriers to iodized salt use.

Access to healthcare

Access to healthcare significantly impacts knowledge and practices related to iodized salt use. A study by Khatiwada et al., (2013) in Nepal found that women with regular access to antenatal care were more likely to have adequate knowledge about iodized salt and its importance during pregnancy. Similarly, Zimmermann *et al.,* (2016) emphasized the role of healthcare providers in

promoting iodized salt use among pregnant women, highlighting the importance of healthcare access.

Previous pregnancy experiences:

Previous pregnancy experiences can influence knowledge and practices regarding iodized salt use. A study by Garnweidner-Holme *et al.,* (2017) in Norway found that women with previous pregnancies had better knowledge about iodine nutrition, including the importance of iodized salt. However, Charlton *et al.,* (2013) found in Australia that even women with multiple pregnancies often had inadequate knowledge about iodine nutrition, suggesting that experience alone may not be sufficient without targeted education.

These studies collectively demonstrate the significant impact of sociodemographic factors on knowledge, attitudes, and practices related to iodized salt use among pregnant women. Age and education level influence knowledge acquisition and adoption of new practices. Socioeconomic status affects access to iodized salt and health information. Cultural background shapes attitudes and traditional practices that may conflict with iodized salt use. Access to healthcare provides opportunities for education and intervention. Previous pregnancy experiences can enhance awareness but may not be sufficient without targeted education.

Understanding these sociodemographic factors is crucial for developing effective, targeted interventions. For instance, Ansari *et al.,* (2020) described a successful program that tailored interventions based on sociodemographic factors, resulting in improved iodized salt utilization among pregnant women across different demographic groups.

These factors can influence a woman's exposure to information about iodized salt, her ability to understand and process this information, her attitudes toward health recommendations, and her capacity to implement recommended practices (Glanz, Rimer, and Viswanath, 2015).

2.7.5 Social Context

Drawing from Bandura's Social Learning Theory, the framework should emphasize the importance of social context in shaping behaviours. This includes:

Family influences

Family dynamics play a crucial role in shaping behaviours related to iodized salt use. A study by Lowe *et al.,* (2015) in Pakistan found that family decision-making structures significantly influenced the adoption of iodized salt. They noted that in households where women had more autonomy in decision-making, the use of iodized salt was higher. Mkumbo *et al.*, (2018) conducted research in Tanzania that highlighted the role of male partners in influencing household salt choices. They found that involving men in education programs about iodized salt led to increased adoption rates.

Peer networks

Peer influence can significantly impact health behaviors. A study by Gebreegziabher and Stoecker (2017) in Ethiopia found that women who participated in peer education groups had better knowledge and practices regarding iodized salt use compared to those who did not.

Community norms

Community norms can either facilitate or hinder the adoption of iodized salt. Knowles et al. (2017) found in their multi-country study that communities with strong social norms favouring traditional non-iodized salt were less likely to adopt iodized salt, even when it was available.

Healthcare system

The healthcare system plays a crucial role in promoting iodized salt use. A study by Khatiwada *et al.,* (2013) in Nepal found that women who received antenatal care were more likely to use iodized salt, highlighting the importance of healthcare provider counselling.

Media messages

Media can be a powerful tool for promoting iodized salt use. Ansari *et al.,* (2020) described a successful program in India that used mass media campaigns to increase awareness and use of iodized salt among pregnant women.

2.7.6 Stages of Change

Incorporating Rogers' Diffusion of Innovation Theory, the framework recognizes that behaviour change occurs in stages:

Knowledge acquisition

The first stage involves becoming aware of iodized salt and its importance. A study by Gidey *et al.,* (2018) in Ethiopia found that women with formal education were more likely to have adequate knowledge about iodized salt, emphasizing the role of education in this stage.

Persuasion

This stage involves forming an attitude towards iodized salt use. Lowe *et al.,* (2015) found in their Pakistan study that addressing misconceptions about iodized salt through targeted education campaigns was crucial for forming positive attitudes.

Decision

The decision stage involves choosing to use or not use iodized salt. Tran et al. (2018) found in Vietnam that price and availability were key factors influencing the decision to use iodized salt, highlighting the importance of addressing these barriers.

Confirmation

This final stage involves seeking reinforcement for the decision and potentially adjusting behaviour. Zimmermann *et al.,* (2016) emphasized the importance of ongoing education and support to reinforce positive behaviours related to iodized salt use.

These studies collectively demonstrate the complex interplay of social factors and stages of change in influencing iodized salt use among pregnant women. Family influences and peer networks can significantly impact decision-making. Community norms can either facilitate or hinder adoption. The healthcare system and media play crucial roles in education and promotion. Understanding these social contexts and stages of change is essential for developing effective interventions.

Bandura's Social Learning Theory (1975) provides a useful framework for understanding how social context influences behaviour. It suggests that people learn by observing others' behaviour and its consequences. This theory helps explain why family influences, peer networks, and community norms are so important in shaping iodized salt use behaviours.

Rogers' Diffusion of Innovation Theory (1995) offers insights into how new practices, like using iodized salt, are adopted over time. By recognizing that behaviour change occurs in stages, interventions can be tailored to address the specific needs and challenges at each stage of the adoption process. Understanding these theories and their applications can help in designing more effective, context-specific interventions to promote iodized salt use among pregnant women.

CHAPTER 3

3.0 RESEARCH METHODS

3.1 Introduction

This chapter sets out the research method adopted to achieve the research objectives. It comprises a description of the research approach, research design, study area, the population, the sample and sampling procedure, the data collection, and the ethical considerations. This chapter also described and justified the data collection procedure, data analysis, and ethical issues.

3.2 Research Methods and Design

A cross-sectional study was conducted from February 2024 through to August 2024 among pregnant women resident in the Ga East Municipality in the Greater Accra Region and receiving antenatal care at six (6) selected health facilities namely; Taifa polyclinic, Ghana Atomic Energy Commission (GAEC), Dome Community Hospital, Community Hospital Ashomang, Kwabenya Community Hospital and Faith Community Hospital. This study design was employed because it is cost-effective, fast, and allows the assessment of multiple variables simultaneously.

3.3 Data Collection Techniques and Tools

The main instrument used for this study was a questionnaire with four (4) parts. The first part consists of the socio-demographic characteristics of the study participants. These include age, religion, level of education, income status, ethnic group, and employment status. The second and subsequent parts consist of questions addressing the level of awareness, practices, and challenges pregnant women face with regards to iodized salt utilization. Participants' confidentiality was ensured by omitting name of participants.

3.4 Study population

Pregnant women who fall within the age of 15-49 years who are residents of Ga East Municipality and attended antenatal clinics formed the population for the study.

3.5 Inclusion criteria

All pregnant women of 15 – 49 years who were residents and visiting the antenatal clinic at Ga East Municipality who consented to participate in this study. And also, were not medically restricted from utilizing iodized salt by a physician (health professionals).

3.6 Exclusion criteria

Pregnant women who did not fall within the age range; of 15-49 years, were non-residents and were restricted from taking iodized salt for medical reasons. Also, those who did not consent to participate in the study

3.7 Study Variables

The parameters that this study measured were divided into dependent and independent variables. The dependent variables for this study were knowledge and practices regarding iodized salt utilization among pregnant women at the Ga East Municipality. The independent variables of interest for this study were the Socio-demographic characteristics of the participants. Thus; Religious affiliation, employment status, level of education, number of children, ethnic group, income status and age. The variables were measured and defined using Univariate and Bivariate analysis. A structured questionnaire from (Negese *et al.*, 2022) was adopted and modified for this study. Pregnant women who scored lower than the mean score for knowledge and practices questions were categorized as having low knowledge and poor practices respectively. Also,

Pregnant women who had the mean score and higher for knowledge and practices questions were categorized as having high knowledge and good practices respectively.

3.8 Sample Size Determination and Sampling Technique

Six Health facilities with antenatal sessions at the Ga East Municipality was selected using a Simple Random technique. The study participants were then selected using a Systematic Random sampling technique. The sample size was calculated using the formula by Cochran (1989).

Thus;

$$\frac{Z^2 \times p(1-p)}{e^2}$$

Where,

n = required sample size,

Z = Critical Value =1.96 at a 95% confidence level

p = current proportion of pregnant women with knowledge and good practices regarding iodized salt utilization is 0.52 (Negese, Tilahun, and Kassie, 2022).

e = margin of error

Therefore,

$$\frac{1.96^2 \times 0.52(1-0.52)}{0.05^2}$$

$$\frac{3.84 \times 0.25}{0.0025} = 384$$

With a non-response rate of 10% (38.4) added to the projected sample size. A total of 422 pregnant women attending antenatal were expected to form the total number of study participants.

3.9 Data handling

Data collected from all the selected health facilities were entered into STATA analytic software (*StataCorp. 2007. Stata Statistical Software. Release 18. StatCorp LP, College Station TX, USA)* for analysis. Data was cleaned to remove data and duplicates. Data has been stored securely using encrypted and password-protected storage media (external hard drives, cloud storage services) for a duration of 5yrs. This will ensure that the data is protected from unauthorized access or breaches.

3.10 Data analysis

Univariate and bivariate analyses were conducted to assess how the variables impact knowledge and practices regarding iodized salt utilization. A confidence interval of 95 % was used to show significant relations between the dependent and independent variables ($p<0.05$).

3.11 Ethical issues

Ethical consideration was obtained from the Institutional Review Board of the Ensign Global College. Administrative approvals were also obtained from all the participatory study centers. Respondents were duly informed about the purpose of the study and consent was sought before answering the questionnaire.

3.12 Limitations of the study

1. The study relied on self-reported data regarding knowledge and practices related to iodized salt utilization. This can lead to inaccuracies due to social desirability bias, where participants may provide responses they believe are more acceptable or favorable rather than their true behaviors or knowledge levels

2. Other variables such as socioeconomic status, access to healthcare services, and general dietary habits could confound results if not controlled for in the study design. These factors might influence both knowledge about iodized salt and actual consumption practices.
3. The timing of data collection may coincide with specific events that could influence responses (e.g., health campaigns promoting iodized salt). Such temporal factors might lead to fluctuations in knowledge or practice that do not reflect long-term trends
4. The KAP model employed in this study lacks contextual understanding. Thus, it often fails to account for socio-cultural factors that influence knowledge and practices. The information gathered may not reflect local beliefs or practices accurately because it does not consider how cultural contexts shape understanding and behaviors related to iodized salt utilization.

3.13 Assumptions

It was assumed that all the study participants understood clearly the structured questionnaire utilized to gather data and that this research instrument accurately measured the desired objectives of the study. Again, it was assumed that all participants were in their right frame of mind and gave honest and truthful response regarding their knowledge on iodized salt and practices associated with iodized salt utilization

CHAPTER 4

4.0 RESULTS

4.1 Introduction

This chapter presents the findings from this study in accordance with the set specific objectives. The results are systematically organized to provide insights into the level of awareness, current practices, and the challenges pregnant women face in accessing and utilizing iodized salt within the Ga East Municipality. These findings offer a comprehensive understanding of the issues surrounding iodized salt utilization in the Ga East Municipality, highlighting areas for potential intervention and improvement.

4.2 Sociodemographic Characteristics of Respondents

Table 1 below summarizes the sociodemographic characteristics of the participants. The sample consists of 394 respondents. The mean age was 30 years (SD = 4.98), ranging from 19 to 42 years. The age range encompasses the primary reproductive years for women. The distribution in **Figure 3** appears to be roughly normal, with a peak around 30 years of age. This shows that most pregnant women in the study are in their late twenties to early thirties. The distribution also shows several smaller peaks, notably around ages 25 and 37, indicating clusters of pregnancies at these ages.

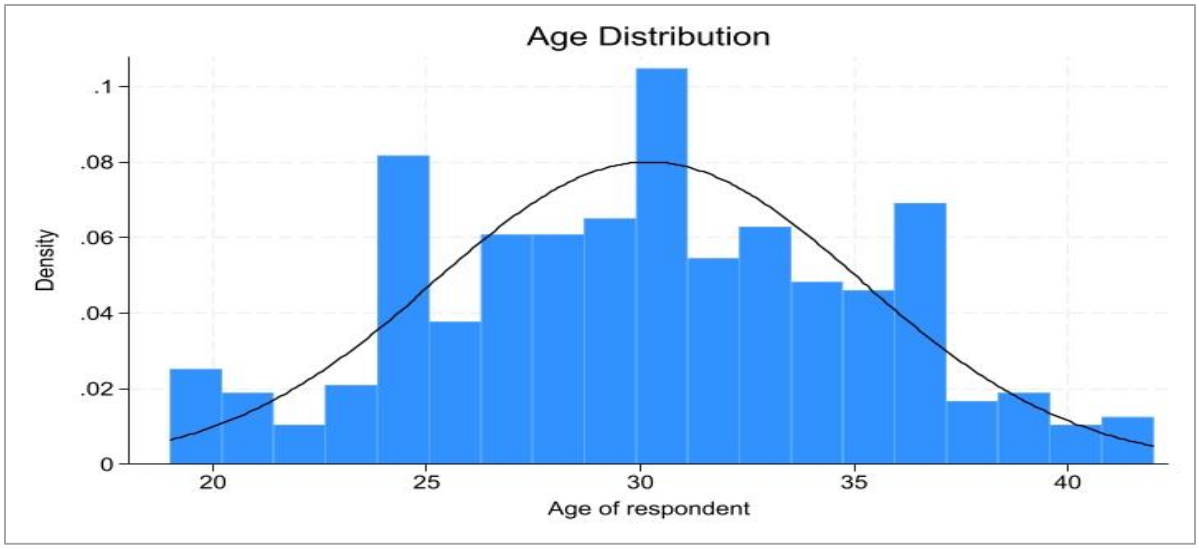

Figure 3 Histogram of Age Distribution

Figure 4 depicts the distribution of respondents' age across categories. Most respondents fall within the 25-30 years (40.86%) and 31-36 years (39.09%) age groups, collectively representing 79.95% of the sample. Younger (19-24 years) and older (37-42 years) age groups comprise smaller proportions at 11.17% and 8.88%, respectively.

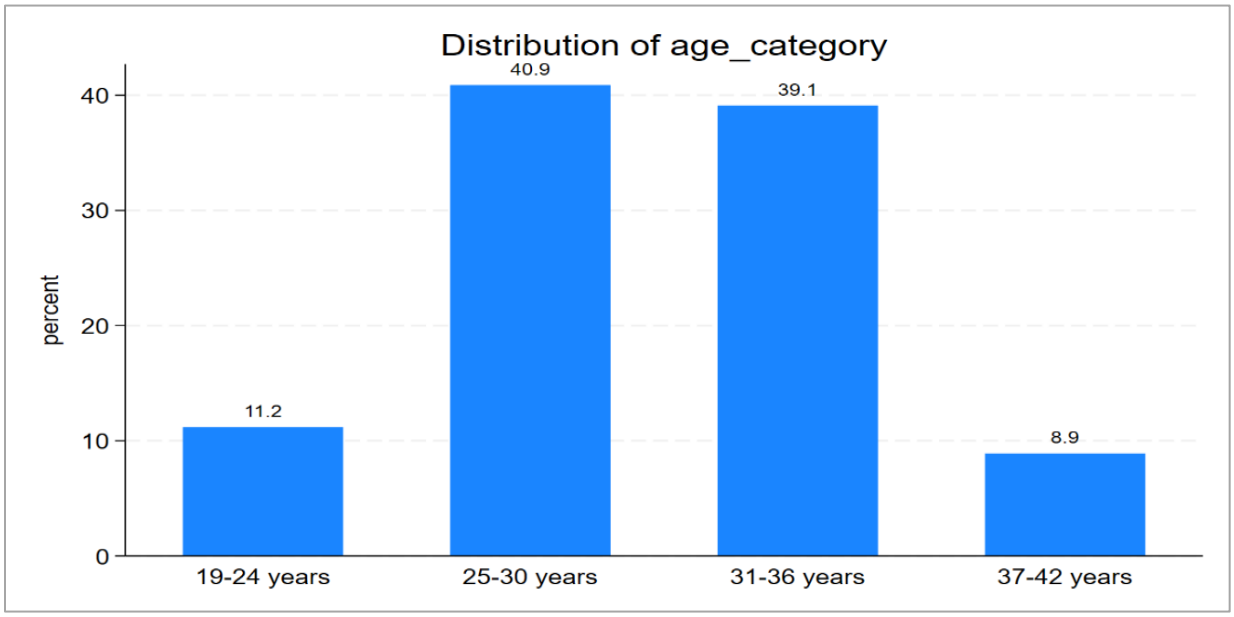

Figure 4 : Distribution of Age Across Categories

Respondents are distributed across seven residential areas, with Christian Village having the highest representation (17.77%), followed by Kisseman and Dome pillar two (both 14.47%). The religious composition of the population shows a strong predominance of Christianity, with 80.5% of individuals identifying as Christian. Muslims constitute a minority at 19.5%.

A majority (57.1%) of respondents are married, a substantial proportion (36.5%) are single and small percentages are divorced (2.3%) or separated (4.1%). This distribution suggests a population with a predominance of traditional family structures.

Nursing and midwifery represent the largest occupational group at 25.6%, closely followed by teaching at 24.1%. These two professions collectively account for nearly half of the sample population, while Food Vendor (11.17%) and Seamstress (10.66%) form the next tier. Other occupations include Trader, Small Business Owner, and Hairdresser. The unemployment rate stands at 8.9%, which is a considerable proportion of the sample.

The income distribution chart reveals a tiered economic structure among the respondents. The mean income is 1303.71 GHS (SD = 761.16), ranging from 0 to 2500 GHS. The distribution indicates that while the largest proportion of pregnant women (39.1%) in the study are in the low-income category, there is a significant proportion in the middle-income segment (35.5%).

On average, respondents have approximately 2 children (SD = 1.45), with a range of 0 to 4 children. The distribution of children among respondents reveals that the largest group (34.0%) has no children, indicating first-time pregnancies. While 14.0% have the largest number of children (4), 15.2% have one child. The larger families with three or four children collectively represent 31.22% of the sample.

The population's educational attainment is distributed across five categories. Tertiary education is the most prevalent, accounting for 32.74% of respondents, closely followed by senior high school (SHS) at 30.71%. These two categories represent over 63% of the sample, indicating a generally well-educated population. Lower educational levels are less represented, with no education and primary education comprising 12.44% and 10.15%, respectively. These results are shown in the table below.

Table 1: Socio-demographic Characteristics of Respondents

Variable	Frequency (N=394)	Percentage
Age Groups		
Mean age (±sd)	30.19 (± 4.99)	
Marital Status		
Single	144	36.6
Married	225	57.1
Divorced	9	2.3
Separated	16	4.1
Religious Affiliation		
Christian	317	80.5
Muslim	77	19.5
Ethnicity		
Ga	191	48.5
Akan	135	34.3
Ga-Adamgbe	31	7.9
Ewe	37	9.4
Educational Level		
No Education	49	12.4
Primary	40	10.2
JHS	55	14.0
SHS	121	30.7
Tertiary	129	32.7
Occupation		
Food Vendor	44	11.2
Teacher	95	24.1
Trader	30	7.6
Small Business Owner	24	6.1

Nurse/Midwife	101	25.6
Hairdresser	23	5.8
Seamstress	42	10.7
Unemployed	35	8.9
Monthly Income		
Low income (0-1000 GHS)	154	39.1
Middle income (1001-2000 GHS)	140	35.5
High income (2001-2500 GHS)	100	25.4
Number of Children		
0	134	34.0
1	60	15.2
2	77	19.5
3	68	17.3
4	55	14.0
Place of Residence		
Dome	44	11.2
Ashomang	56	14.2
Estate	55	14.0
Christian Village	70	17.8
Taifa	55	14.0
Kisseman	57	14.5
Dome Pillar Two	57	14.5
Trimester Status		
1st Trimester	130	33.0
2nd Trimester	138	35.0
3rd Trimester	126	32.0

Source: *Field data, 2024*

4.3 Level of Awareness on The Utilization of Iodized Salt Amongst Pregnant Women in the Ga East Municipality

The study records 55.1% of respondents are aware of the effects of iodine deficiency in pregnancy, while 44.9% are not. This nearly even split suggests that there is still a significant portion of the population that lacks knowledge about the importance of iodine during pregnancy, despite its critical role in fetal development and maternal health.

With regards to awareness of iodized salt utilization, a more pronounced difference is observed, with 70.3% of respondents indicating awareness of iodized salt usage, compared to 29.7% who were not aware. An overwhelming majority of 82.1% have heard of iodized salt, while only 17.9% have not. This high level of recognition indicates that iodized salt has become a well-known concept among the surveyed population. Among those who do not use iodized salt, 24.37% have heard about it, while 5.33% have not. This suggests that awareness does not necessarily translate to usage.

The primary sources of information about iodized salt were Friends/Neighbors (24.37%), Television (20.05%), Health workers (19.80%), Printed material (19.54%), and Radio (16.24%).

Respondents identified several perceived advantages of using iodized salt including Makeup for iodine in body (29.19%), Better digestion (24.37%), Better taste (24.11%), as well as, Prevent IDDs (Iodine Deficiency Disorders) (22.34%).

The data also reveal that respondents are aware of various consequences of iodine deficiency, with varying levels of recognition. Abortion/Stillbirth/Miscarriage was the most recognized consequence, with 28.43% of respondents identifying it. Closely following, 27.41% of respondents recognized decreased fertility as a consequence, indicating a good understanding of iodine's role in reproductive health. Interestingly, only 18.53% of respondents identified goiter, which is one of the most visible signs of iodine deficiency.

Cumulative Score for knowledge ranges from 5 to 18 with a mean score of 11.2. Participants who scored ≥ 11.2 were defined as having high knowledge or level of awareness of iodized salt and those who had scores below the mean were defined as having low knowledge.

The most common scores representing 57.11% of the respondents fall below the mean score. This suggests that a significant portion of the population has low knowledge. 42.89 % of respondents had scores ≥ 11 representing very few of the respondents achieved high scores (11-18), demonstrating high knowledge.

Iodized salt emerges as the most widely recognized source of iodine, with 45.9% of respondents identifying it. The awareness of other iodine-rich food sources is relatively consistent, but notably lower than iodized salt. Meat is recognized by 31.2% of respondents, Fish follows closely at 30.5%, and Dairy products are identified by 30.2%. Eggs are the least recognized among these natural sources, with 28.7% awareness. The results are summarized in the table and figure below.

Table 2: Level of Awareness on Iodized Salt Utilization Among Pregnant Women in the Ga East Municipality

Variable	Category	Total (n=394)	Percent (%)
Knowledge Level	**Category of knowledge scores**		
	Low	225	57.1
	High	169	42.9
Awareness of Iodine Deficiency	**Are you aware of the effects of iodine deficiency in pregnancy?**		
	Yes	217	55.1
	No	177	44.9
Use of Iodized Salt	**Do you use iodized salt?**		
	Yes	277	70.3
	No	117	29.7
Heard About Iodized Salt	**If no, have you heard about iodized salt?**		
	Yes	96	24.4

	No	21	5.3
	Missing (use iodized salt)	277	70.3
Source of Information About Iodized Salt	**How did you learn about iodized salt?**		
	Radio	64	16.2
	Television	79	20.1
	Printed material	77	19.5
	Friends/Neighbors	96	24.4
	Health workers	78	19.8
Advantages of Using Iodized Salt	**What are the advantages of using iodized salt?**		
	Better taste	95	24.1
	Better digestion	96	24.4
	Makeup for iodine in body	115	29.2
	Prevent IDDs	88	22.3
Consequences of Iodine Deficiency	**What are the consequences of iodine deficiency?**		
	Goiter	73	18.5
	Cretinism/Mental retardation	101	25.6
	Abortion/Stillbirth/Miscarriage	112	28.4
	Decreased fertility	108	27.4

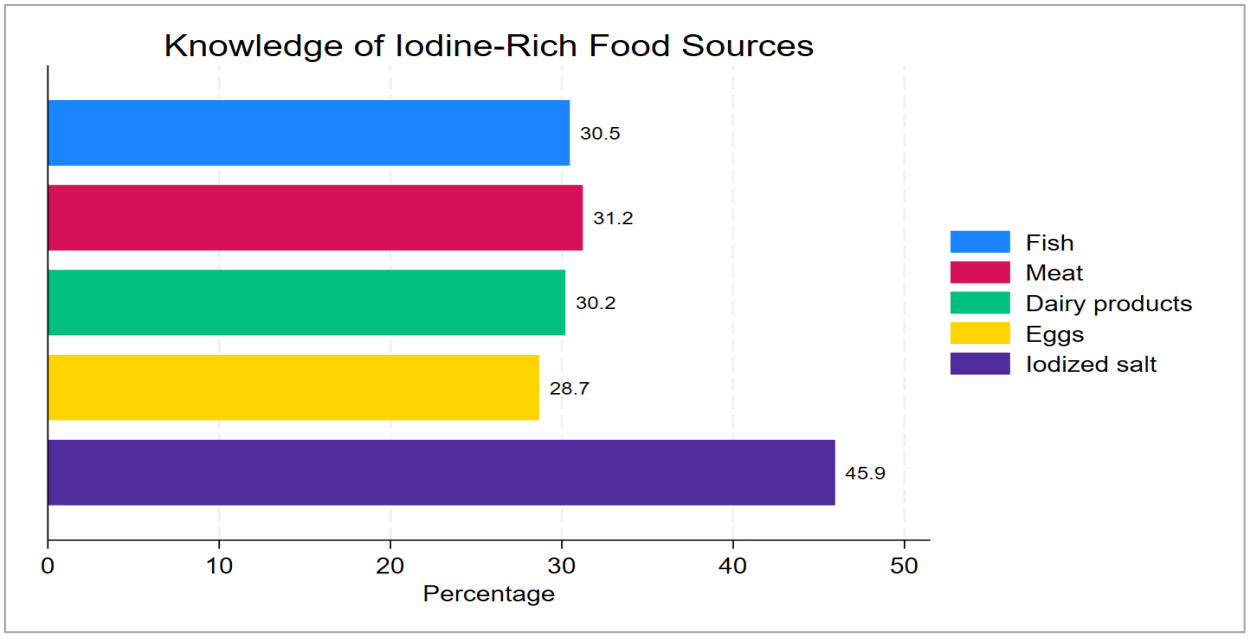

Figure 5: Knowledge of Iodine-Rich Food Sources

4.4 Current Practices Regarding Iodized Salt Utilization Amongst Pregnant Women in the Ga East Municipality

The data reveals diverse salt storage methods among the respondents. The most prevalent method is storing salt in a container with a closed lid (38.58%), followed by retaining it in the original packaging material (26.14%). A significant portion (14.47%) uses containers without lids, while 11.17% opt for light-proof containers. Only 9.64% keep salt in an open package.

The timing of salt addition during cooking varies among the respondents. The most common practice is adding salt during the cooking process (34.26%), followed by adding salt at the end of cooking (26.65%). A considerable portion (20.81%) adds salt at the beginning of cooking, while 18.27% report no regular pattern.

With regards to salt type preferences, powdered salt emerged as the predominant choice for cooking, used by 61.17% of respondents. Rock salt is preferred by 23.35%, while 15.48% use both types. Notably, 70.30% of respondents report using iodized salt, while 29.70% do not.

The population is almost evenly split regarding salt storage duration at home. Slightly over half (50.25%) store their salt for more than two weeks, while 49.75% store it for less than two weeks. The storage locations for salt are distributed across three main categories. The most common practice is storing salt near the stove in the kitchen (35.79%), followed closely by exposure to sunlight (32.49%). A significant portion (31.73%) stores salt far from sunlight and fire.

Regarding how iodized salt should be stored, a majority of respondents (69.04%) report storing iodized salt in a dry place. However, it is noteworthy that nearly one-third (30.96%) of the sample does not adhere to this practice, potentially compromising the quality of their iodized salt.

61.93% of the respondents store their salt away from direct sunlight contact, while a significant proportion (38.07%) does not follow this. The most widely adopted practice is the use of closed containers for salt storage, with 77.41% of respondents following this method. Nevertheless, 22.59% do not use closed containers, which may expose their salt to contaminants and moisture. A small but notable percentage (9.90%) of respondent's report having no special place for salt storage. Encouragingly, only a small proportion (7.36%) of respondents indicate that they don't know how to store iodized salt properly.

The most prevalent storage practice, adopted by 77.4% of the respondents, is the use of a closed container. The second most common practice, reported by 69.0% of respondents, is storing salt in a dry place. A significant proportion of respondents (61.9%) store their salt away from direct sunlight. However, the data also reveals areas of potential concern. A small but notable percentage

(9.9%) of respondent's report having no special place for salt storage. Furthermore, 7.4% of respondents indicated that they "don't know" about their salt storage practices.

Cumulative Score for Practice range from 0 to 4 with a mean score of 2.79. Pregnant women who had a score ≥ 2.79 were categorized as having good practices and those with scores below the mean were categorized as having poor practices. The data reveals a distribution of practice scores ranging from 0 to 4, with the majority of respondents clustered in the mid to high range. Notably, 41.12% of respondents scored 3, while 23.60% achieved the highest score of 4. Cumulatively, 64.72% of the sample scored 3 or 4, indicating generally good practices regarding iodized salt utilization. However, there is still room for improvement, as 35.28% scored 2 or below, with 8.12% scoring 1 or 0. Below is a summary of the results depicted in a tabular form

Table 3: Current Practices on Iodized Salt Utilization Among Pregnant Women in the Ga East Municipality

Variable	Category	Total (n=394)	Percent (%)
Practice Scores	**Practice scores regarding iodized salt utilization**		
	Poor	139	35.7
	Good	255	64.7
Salt Storage Practices	**How do you usually store your salt?**		
	In an open package	38	9.6
	In a container without a lid	57	14.5
	In a container with a closed lid	152	38.6
	Retained in the packaging material	103	26.1
	Light proof container	44	11.2
	For how long have you stored your salt at home?		

Salt Storage Duration	More than two weeks	198	50.3
	Less than two weeks	196	49.8
Salt Storage Location	**Where do you store your salt?**		
	Far from sunlight and fire	125	31.7
	Near the stove in kitchen	141	35.8
	Exposed to sunlight	128	32.5
Salt Adding Time	**At what time do you add salt during cooking?**		
	At the beginning	82	20.8
	During cooking	135	34.3
	At the end	105	26.7
	No regular pattern	72	18.3
Type of Salt Used	**What type of salt do you use for cooking?**		
	Powdered salt	241	61.2
	Rock salt	92	23.4
	Both	61	15.5
Salt Storage Recommendations	**How should iodized salt be stored?**		
	Dry place	272	69.0
	With no direct sunlight contact	244	61.9
	In a closed container	305	77.4
	No special place	39	9.9
	I don't know	29	7.4
Practice Scores	**Practice scores regarding iodized salt utilization**		
	0	6	1.5
	1	26	6.6
	2	107	27.2
	3	162	41.1
	4	93	23.6

Source: *Field data, 2024*

4.5 Assessment of Facilitators and Challenges in Accessing and Utilizing Iodized Salt Amongst Pregnant Women in the Ga East Municipality

Various factors facilitate iodized salt utilization among pregnant women in the Ga East Municipality. 42.64% of respondents indicate that healthcare worker advice motivates their use of iodized salt. However, the majority (57.36%) do not cite this as a motivating factor. Awareness of iodized salt's role in preventing goiter is nearly evenly split among respondents, with 49.75% citing this as a motivation and 50.25% not.

Only 28.17% of respondents cite family traditions as a motivator for using iodized salt. However, the majority (71.83%) are not influenced by this factor. Furthermore, 39.85% of respondents indicate that personal preferences motivate their use of iodized salt. While this represents a significant minority, the majority (60.15%) do not cite personal preference as a motivator.

The ease of availability is cited as a motivating factor by 59.39% of respondents. However, a substantial 40.61% do not consider availability as a motivator. Interestingly, the population is evenly split (50% each) regarding awareness of iodine deficiency risks as a motivator.

The respondents also pointed out difficulties encountered in utilizing iodized salt. Financial constraints emerge as the most significant barrier, accounting for 28.2% of the reported difficulties. Family preferences, constitute the second most significant obstacle, representing 25.9% of the difficulties while beliefs account for 24.4% of the reported difficulties.

Lastly, availability issues represent 21.6% of the challenges, indicating that a significant portion of the population faces difficulties in accessing iodized salt. Refer to the table below

Table 4: Facilitators and Challenges in Accessing and Utilizing Iodized Salt Amongst Pregnant Women in the Ga East Municipality

Variable	Category	Total (n=394)	Percent (%)
Difficulties in Utilizing Iodized Salt	**What difficulty do you face in utilizing iodized salt?**		
	Financial constraints	111	28.2
	Availability	85	21.6
	Not preferred by family	102	25.9
	Beliefs	96	24.4
Salt Purchase Criteria	**What do you look out for before you buy salt?**		
	Expiry date	123	31.2
	Brand	149	37.8
	Iodine labelling	122	31.0
Motivators for Utilizing Iodized Salt	**What motivates you to access or utilize iodized salt amidst the challenges?**		
	Health workers' advice	168	42.6
	Prevents goiter	196	49.8
	Family traditions	111	28.2
	Personal preferences	157	39.9
	Easily available	234	59.4
	Awareness of iodine deficiency risks	197	50.0

Source: *Field data, 2024*

4.6 Bivariate Analysis of Selected variables on the Chosen Dependent Variable

A Pearson's Chi-Square test was conducted to measure the association between various independent variables (Education, Income, Trimester, Number of Children, Religion, Residence) and the knowledge and practices regarding iodized salt utilization reported by respondents. The

analysis indicates that education (p<0.001) show a statistically significant association with knowledge on iodized salt. Conversely, Income (p = 0.168), Trimester (p = 0.514), Number of Children (p = 0.611), Religion (p = 0.158) and Residence (p = 0.58) are not significantly associated with knowledge or level of awareness. Thus, participants' income, duration/term of pregnancy, number of children she has, religious affiliation, and where they reside do not influence their knowledge of iodized salt utilization.

Also, the analysis indicates that Knowledge (p< 0.232) is not significantly associated with practices regarding iodized salt utilization. This means that knowing iodized salt utilization does not necessarily translate into practice or its utilization. Refer to **Tables 5-7** below for the summary of the results.

Table 5: Bivariate Analysis of Selected Socio-Demographic Variables on Level of Awareness

Variable	Category	Knowledge		P-value
		Low n(%)	High n(%)	
Education	No Education	29(59.2)	20(40.8)	0.001
	Primary	27(67.5)	13(32.5)	
	JHS	19(34.6)	36(65.5)	
	SHS	81(66.9)	40(33.1)	
	Tertiary	69(53.5)	60(46.5)	
Income	Low Income (0-1000)	93(60.4)	61(39.6)	0.168
	Middle Income (1001-2000)	71(50.7)	69(49.3)	
	High Income (2001-2500)	61(61.0)	39(39.0)	
Trimester	1st	73(56.2)	57(43.9)	0.514
	2nd	75(54.4)	63(45.7)	
	3rd	77(61.1)	49(38.9)	
Number of Children	0	78(58.2)	56(41.8)	0.611
	1	39(65.0)	21(35.0)	
	2	42(54.6)	35(45.5)	
	3	35(51.5)	33(48.5)	
	4	31(56.4)	24(43.6)	
Religion	Christian	I87(59.0)	130(41.0)	0.158
	Muslim	38(49.4)	39(50.7)	

Residence	Dome	27(61.4)	17(38.6)	0.58
	Ashomang	34(60.7)	22(39.3)	
	Estate	29(52.7)	26(47.3)	
	Christian Village	37(52.9)	33(47.1)	
	Taifa	36(65.5)	19(34.6)	
	Kisseman	34(59.7)	23(40.4)	
	Dome Pillar two	28(49.1)	29(50.9)	

Table 6: Bivariate Analysis of Selected Socio-Demographic Variables on Practice Level

Variable	**Category**	**Practices**		**P-value**
		Poor n(%)	**Good n(%)**	
Education	No Education	44(89.8)	5(10.2)	0.037
	Primary	30(75.0)	10(25.0)	
	JHS	37(67.3)	18(32.7)	
	SHS	97(80.2)	24(19.8)	
	Tertiary	93(72.1)	36(27.9)	
Income	Low Income (0-1000)	121(78.5)	33(21.4)	0.684
	Middle Income (1001-2000)	104(74.3)	36(25.7)	
	High Income (2001-2500)	76(76.0)	24(76.0)	
Trimester	1st	104(80.0)	26(20.0)	0.434
	2nd	105(76.1)	33(23.9)	
	3rd	92(73.0)	34(27.0)	
Number of Children	0	111(82.8)	23(17.2)	0.089
	1	49(81.7)	11(18.3)	
	2	54(70.1)	23(29.9)	
	3	48(70.6)	20(29.4)	
	4	39(70.9)	16(29.1)	
Religion	Christian	243(76.7)	74(23.3)	0.881
	Muslim	58(75.3)	19(24.7)	
Residence	Dome	38(86.4)	6(13.6)	0.207
	Ashomang	40(71.4)	16(28.6)	
	Estate	38(69.1)	17(30.9)	
	Christian Village	53(75.7)	17(24.3)	
	Taifa	40(72.7)	15(27.3)	
	Kisseman	49(86.0)	8(14.0)	
	Dome Pillar two	43(75.4)	14(24.6)	

Table 7: Bivariate Analysis of Knowledge and Practices regarding Iodized Salt Utilization

Knowledge	Practices		P-value
	Poor n(%)	Good n(%)	
Low	177 (78.7)	48 (21.3)	0.232
High	124(73.4)	45(26.6)	

CHAPTER 5

5.0 DISCUSSION

5.1 Level of awareness regarding Iodized salt utilization amongst pregnant women

The study assessed the level of awareness regarding Iodized salt utilization among respondents. The findings from the study revealed that (42.9%) of the respondents had a high level of knowledge on the utilization of Iodized salt. This finding is higher than a similar study conducted in Eastern Ethiopia which found knowledge among respondents to be (37.7%) (Mohammed *et al.* 2024). Similarly, a study conducted in Norway also found knowledge on Iodized salt utilization to be (25.5%) (Garnweidner-Holme *et al.* 2017). Likewise, in Tehran, knowledge level was (26%). Additionally, another study in Ethiopia also reported knowledge level of (28.7%) (Mirmiran *et al.* 2015). These discrepancies may be due to differences in study settings, sociodemographic characteristics, sample sizes, and the knowledge assessment tools used. Additionally, differences in the availability and affordability of iodized salt in local markets across these regions could also impact the awareness levels observed.

In contrast, the findings from this study are lower than those of a study conducted in West Shoa Zone, where the knowledge level of respondents was 53.5% (Gemede *et al.* 2021). Another study in Gondor reported a knowledge level of 50.1% (Bazezew *et al.* 2018), while a similar study in Ghana found a higher knowledge level of 72% among respondents (Buxton and Baguune 2022). The possible reasons for this finding could include differences in educational outreach, cultural practices, and the availability of information regarding the health benefits of iodized salt. In some regions, there might be less emphasis on public health campaigns or fewer resources devoted to

educating the population about iodine deficiency disorders and the importance of using iodized salt. Sociodemographic factors such as educational attainment, income level, and access to health information could also contribute to the variation in knowledge levels observed across different studies. Additionally, the study in Tehran focused on women living in poor and slum areas, whereas the current study was conducted in a more urban setting.

5.2 Practices on Iodized Salt Utilization Among Pregnant Women

The study revealed that the majority (64.7%) of the respondents demonstrated a good level of practice regarding the use of iodized salt. This finding is consistent with existing literature but notably higher compared to a study in Eastern Ethiopia, where only 37.7% of respondents exhibited similar practices (Mohammed *et al.* 2024). Another study in Thailand also reported practice level of 23.3% (Khamsingnork *et al.* 2016). Similarly, a study in Hawassa city found practice level among the respondents to be 52.3% (Negese *et al.* 2022). Likewise, in West Shewa practice level was found to be 45.4% among the respondents (Gemede *et al.* 2021). These differences in practice levels could be due to various factors, such as the accessibility and affordability of iodized salt, local dietary habits, cultural beliefs regarding salt use, and the effectiveness of public health campaigns in these areas. Moreover, sociodemographic factors like education levels, income, and awareness about the health benefits of iodized salt could influence these practices. The variation in findings might also result from differences in study designs, sample sizes, and the assessment methods used, which could affect the comparability of results.

Conversely, the finding from this study is lower than a study conducted in Addis Ababa which revealed that 76.3% of the respondents had good practice on iodized salt (Bazezew *et al.* 2018). Another study conducted in Nepal also found that 67.0% of the respondents demonstrated a good

level of practice (Rijal and Basnet 2023). Similarly, a study in Bangladesh also found that 71.7% of the respondents had moderate level practice regarding iodized salt (Habib *et al.* 2021). These variations in practice levels can be attributed to differences in sociodemographic characteristics, sample sizes, and the assessment methods employed. Additionally, it's important to consider that the context in which these studies are conducted could greatly influence the results. For instance, urban areas might show higher levels of practice due to better access to information and resources, while rural areas might have lower levels due to logistical challenges and limited exposure to health promotion messages.

5.3 Assessment of facilitators and challenges in accessing and utilizing iodized salt among pregnant women

Several factors facilitated the respondents to use iodized salt despite the challenges they may face. The most frequently cited facilitator in the current study was the easy availability of iodized salt (59.39%), which suggests that when iodized salt is readily accessible, individuals are more likely to use it. This finding is consistent with the study by Abebe *et al.* (2017), which emphasized that accessibility is a crucial determinant in the utilization of iodized salt. Awareness of iodine deficiency risks was also a significant motivator (50.00%), highlighting the role of education and awareness campaigns in encouraging proper health practices. Similarly, the facilitator to prevent goiter (49.75%) aligns with previous studies by (Heimberg *et al.* 2022), which found that knowledge of specific health benefits can drive adherence to health interventions.

Health workers' advice (42.64%) was another critical facilitator, revealing the influence of healthcare professionals in shaping health behaviors. This supports findings by de Frel *et al.* (2023), who noted that recommendations from health workers significantly increase the likelihood

of individuals adopting healthier practices. Personal preferences (39.85%) and family traditions (28.17%) also play a role, which reflects the socio-cultural dynamics that influence health behavior, as discussed by Ratnasari (2023).

Despite these facilitators, some challenges hinder the consistent use of iodized salt among the pregnant women in this study. Financial constraints were reported by 28.17% of respondents, suggesting that cost remains a significant barrier for some individuals. This finding is consistent with the study by (Gautam *et al.* 2023), which highlighted that economic factors can limit access to health-promoting resources. Availability issues (21.57%) further complicate utilization, indicating that in some areas, iodized salt may not be as accessible, which is similar to the findings of Mukherjee *et al.* (2021) who reported that logistical issues often limit access in rural or underserved areas. Additionally, 25.89% of respondents mentioned that iodized salt is not preferred by their family, and 24.37% reported that certain beliefs impede its use. These sociocultural barriers resonate with the findings of Nyande *et al.,* (2022), which discussed how cultural beliefs and family preferences can significantly impact the adoption of health interventions.

CHAPTER 6

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

In conclusion, the findings of this study provide insights into the awareness, practices, facilitators, and challenges related to iodized salt utilization among pregnant women. The study found that 42.9% of respondents had a high level of knowledge regarding the utilization of iodized salt. Additionally, the study revealed that 64.7% of respondents demonstrated good practices in using iodized salt. Moreover, the study identified several facilitators for the use of iodized salt, such as its availability, awareness of iodine deficiency risks, and health workers' advice. However, challenges such as financial constraints, limited availability, family preferences, and cultural beliefs were also reported as significant barriers to consistent use.

6.2 RECOMMENDATIONS

Based on the findings of the study, the following recommendations have been proposed;

1. The Ghana Health Service should develop and implement comprehensive public health education campaigns focused on the benefits of iodized salt. These campaigns should be tailored to different regions and cultural jurisdictions to effectively reach and educate pregnant women and the general population.
2. The Ministry of Health should introduce and enforce policies that ensure the availability and affordability of iodized salt. This could include subsidies, price controls, or incentives for producers and vendors.

3. Healthcare training institutions should integrate training programs for healthcare workers into ongoing professional development. These programs should focus on effective communication about the benefits of iodized salt and strategies for promoting its use among pregnant women.
4. Community health workers in collaboration with community leaders should engage local leaders, religious groups, and community-based organizations to address cultural beliefs and practices that hinder the use of iodized salt. These groups can play a crucial role in promoting positive health behaviors and influencing family preferences.
5. The Ghana Health Service should collaborate with NGOs that focus on health and nutrition to implement culturally sensitive interventions and advocacy campaigns aimed at overcoming socio-cultural barriers regarding iodized salt utilization

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APPENDICES

APPENDIX 1

CONSENT FORM (PARTICIPANTS)

TITLE OF STUDY: KNOWLEDGE AND PRACTICES REGARDING IODIZED SALT UTILIZATION AMONGST PREGNANT WOMEN AT THE GA EAST MUNICIPALITY IN THE GREATER ACCRA REGION OF GHANA.

General Information about Research

Pregnancy-related iodine deficit can be avoided with the help of iodized salt. To safeguard both the health of the expectant mother and the unborn child, it is imperative to evaluate the knowledge and habits of expectant mothers regarding iodized salt utilization.

This assessment's objective is to appraise your level of awareness and practices regarding iodized salt utilization. Healthcare practitioners will benefit from the information acquired in understanding the existing state of affairs and creating targeted interventions to encourage pregnant women to take iodized salt. This study will take 15 minutes of your time. A series of questions would be posed to you, and you would be required to answer them to the best of your knowledge and prevailing circumstances. Do well to seek further clarification when in doubt.

Benefits/Risks of the study

There are no known dangers connected to taking part in this evaluation. Findings obtained from this study, however, could contribute to improving public health policies and interventions related to iodine deficiency disorders (IDD) in pregnant women in Ghana.

Confidentiality

• Every piece of data gathered for this evaluation will only be utilized in this study. No information will be shared with anybody except my supervisor. No reports or published materials will disclose the participant's identity.

• You are entitled to access the personal data gathered about you for the study.

Compensation

There are no compensation packages except verbal appreciation. However, a piece of toilet roll will be given to each participant at the end of the study.

Withdrawal from Study

If you choose not to participate or subsequently decide not to, it won't negatively impact you.

- You are under no obligation to continue with this study, and you are free to stop at any moment.
- We shall promptly notify you or your legal representative of any new information that could affect your decision to either continue participating or withdraw.

Contact for Additional Information

- Please contact me in case of any issues related to the study

  Researcher: Kartumi Asuama Rafat

  Ensign Global College, Kpong, Eastern Region-Ghana

  0550335962

Participant Agreement

"I have read and understood the information provided above. I voluntarily agree to participate in the assessment of knowledge and practices related to iodized salt utilization amongst pregnant women".

_____

Name of Participant

_____ _____

Signature or mark of Participant Date

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____

Name of Person who Obtained Consent

_____ _____

Signature of Person Who Obtained Consent

APPENDIX 2
STRUCTURED QUESTIONNAIRE

Title: KNOWLEDGE AND PRACTICES REGARDING IODIZED SALT UTILIZATION AMONG PREGNANT WOMEN AT THE GA EAST MUNICIPALITY IN THE GREATER ACCRA REGION OF GHANA

SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS

Date: Time:

Check the brackets ( ) that apply.

1. Age:
2. Place of residence:……..
3. Marital Status: ( ) Married, ( ) Divorced, ( ) Single, ( ) Separated
4. Number of children: ……
5. Trimester status: ( )1st, ( ) 2nd, ( )3rd
6. Occupation: ( ) Unemployed, ( )Student, ( )Self-employed, ( ) Government employed, Other Specify…….
7. Income (Monthly):……..
8. Religious affiliation: ( ) Christian, ( ) Muslim, ( )Other: Specify……
9. Ethnicity ( )Ga, ( )Akan, ( )Ga-Agdangbe, ( )Ewe
10. Level of education: ( )Tertiary, ( )Secondary, ( ) Primary, Other: Specify……..

SECTION B: KNOWLEDGE OF IODIZED SALT UTILIZATION

11. Do you use iodize salt? ( )yes, ( ) No If No; Have you heard about iodized salt? ( )Yes ( ) No
12. How did you learn about iodized salt? ( ) Radio, ( )television, ( )Printed material ( )Friends/neighbours ( )Health workers, Others specify…….

13. What food sources are rich in iodine?.....
14. Are you aware of the effects of iodine deficiency in pregnancy? ( )Yes ( ) No
15. Should iodized salt be handled in the store and household with greater care than non-iodized salt? ( ) Yes, ( ) No
16. How should iodized salt be stored? ( ) Dry place, ( )With no direct sunlight contact, ( )In a closed container, ( ) No special place, ( ) I don't know
17. What are the advantages of using iodized salt? ( ) Better taste, ( )Better digestion, ( )Makeup for iodine in the human body, ( )Prevent IDDs such as goiter, miscarriage, etc. ( ) I don't know, Other ……..
18. What are the consequences of Iodine deficiency? ( ) Goiter, ( )Cretinism/mental retardation in children, ( ) Abortion/stillbirth/miscarriage, Other…….
19. Regular consumption of iodized salt can eliminate iodine deficiency in the body. ( ) Yes, ( ) No
20. Which group or population should receive more iodine than others?

    ( ) Children, ( )Pregnant women, ( ) All people need the same amount, ( ) I don't know, Other ……..
21. Is there any legal framework in Ghana that prohibits the production, trade, and sale of non-iodized salt? ( ) Yes, ( )No, ( )I don't know

SECTION C: PRACTICES REGARDING IODIZED SALT UTILIZATION

22. At what time do you add salt during cooking? ( ) At the beginning, ( )During cooking, ( )At the end, ( ) No regular pattern

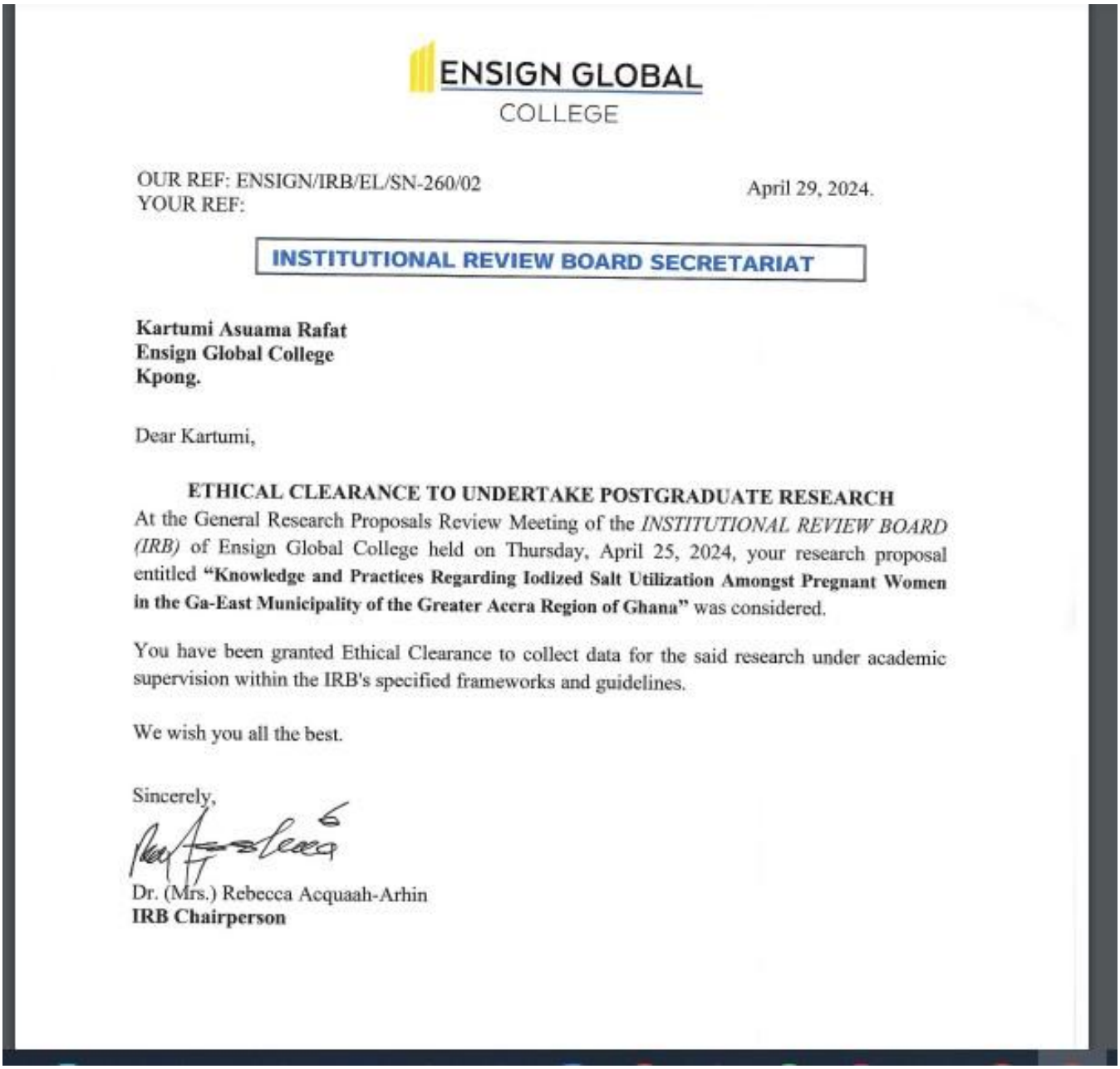
23. How do you usually store your salt? ( ) In an open package, ( )In a container without a lid, ( )In a container with a closed lid, ( ) Retained in the packaging material, ( ) Light proof container
24. Where do you store your salt? ( ) Exposed to sunlight, ( )Near the stove (fire) in the kitchen, ( )Far from sunlight and fire, ( ) Other specify……..
25. What type of salt do you use for cooking? ( ) Powdered salt, ( ) Rock salt, ( ) Both
26. For how long have you store your salt at home? ( ) More than two (2) weeks, ( ) Less than two (2) weeks, ( )Other; Specify……
27. What do you look out for before you buy salt? ( ) Expiry date, ( ) the brand, ( )iodine labelling, ( ) Unknown

SECTION D: CHALLENGES ENCOUNTERED REGARDING IODIZED SALT UTILIZATION

28. What difficulty do you face in utilizing/accessing iodized salt? ( ) Financial constraints, ( ) Availability, ( ) Not preferred by family, ( ) Beliefs ( ) Other; Specify……..
29. What motivates you to access or utilize iodized salt amidst the challenges?.....

    …….
30. Have you been diagnosed with Iodine Deficiency Disorder (IDD)? ( ) Yes ( ) No
31. Do you have relatives or know of someone who has been diagnosed with IDD? ( ) Yes ( ) No, if yes who?.....
32. Does everyone utilize salt in your home? ( ) Yes No ( ) if no why?.....

APPENDIX 3: Ethical Clearance



ENSIGN GLOBAL
COLLEGE

OUR REF: ENSIGN/IRB/EL/SN-260/02
YOUR REF:

April 29, 2024.

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Kartumi Asuama Rafat
Ensign Global College
Kpong.

Dear Kartumi,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

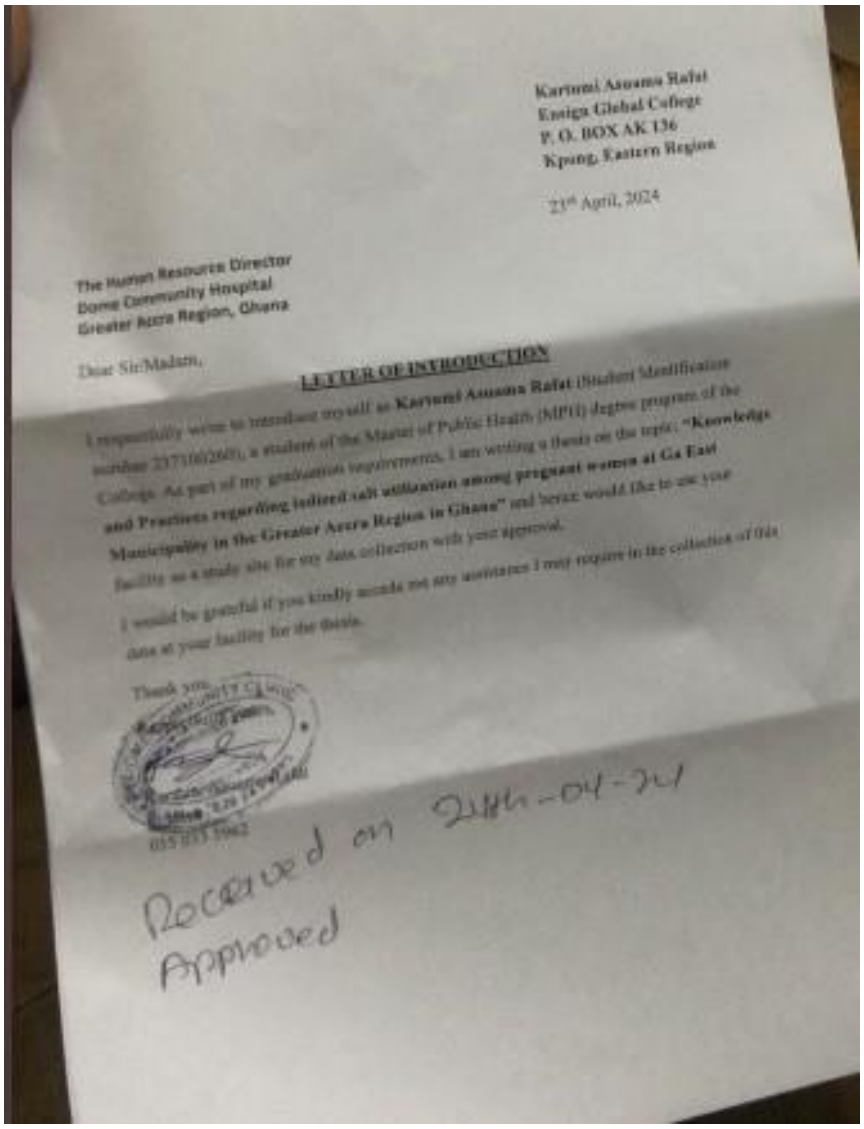
At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global College held on Thursday, April 25, 2024, your research proposal entitled **"Knowledge and Practices Regarding Iodized Salt Utilization Amongst Pregnant Women in the Ga-East Municipality of the Greater Accra Region of Ghana"** was considered.

You have been granted Ethical Clearance to collect data for the said research under academic supervision within the IRB's specified frameworks and guidelines.

We wish you all the best.

Sincerely,

Dr. (Mrs.) Rebecca Acquaah-Arhin
IRB Chairperson



Karimu Asuama Rafat
Ensign Global College
P. O. BOX AK 136
Kpong, Eastern Region

21st April, 2024

The Human Resource Director
Dome Community Hospital
Greater Accra Region, Ghana

Dear Sir/Madam,

LETTER OF INTRODUCTION

I respectfully write to introduce myself as **Karimu Asuama Rafat** (Student Identification number 2371002608), a student of the Master of Public Health (MPH) degree program of the College. As part of my graduation requirements, I am writing a thesis on the topic, **"Knowledge and Practices regarding iodized salt utilization among pregnant women at Ga East Municipality in the Greater Accra Region in Ghana"** and hence would like to use your facility as a study site for my data collection with your approval.

I would be grateful if you kindly accede me any assistance I may require in the collection of this data at your facility for the thesis.

Thank you.

055 815 5962

Received on 21st-04-24
Approved