



FACULTY OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

ON

TIMING OF INTRODUCTION OF COMPLEMENTARY FOODS AND ITS ASSOCIATION
WITH STUNTING IN THE HO MUNICIPALITY, VOLTA REGION, GHANA

BY

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June, 2026

**ENSIGN GLOBAL UNIVERSITY, KPONG
EASTERN REGION, GHANA**

**FACULTY OF PUBLIC HEALTH
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**A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, FACULTY
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REQUIREMENTS FOR THE
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DECLARATION

I, **Annette Semenyo Nutsukpo**, 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 University, Kpong is the result of my own investigation, and has not been presented for any other degree elsewhere.

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DEDICATION

This work is dedicated to God Almighty for His grace, strength, and guidance throughout this academic journey.

I also dedicate this study to my parents, Mr Delali Kofi Nutsukpo and Mrs Florence Akoto, and to my sister, Dr Pamela Nutsukpo, as well as my entire family for their unwavering love, support, and sacrifices, which have been the foundation of my success.

To all caregivers and mothers who strive daily to ensure the health and well-being of their children, this work is especially dedicated to you. Your efforts continue to inspire the pursuit of better child nutrition and health outcomes.

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Operational Definitions

1. **Complementary Feeding:** The process of introducing nutritionally adequate and safe solid, semi-solid, or soft foods and liquids to an infant from six months of age while breastfeeding continues (WHO, 2023).
2. **Complementary Food:** Any solid, semi-solid, or soft food or liquid, other than breast milk or infant formula, given to an infant aged 6–24 months to provide additional energy and nutrients.
3. **Early Introduction of Complementary Foods:** The introduction of complementary foods before the infant reaches six months of age.
4. **Timely Introduction of Complementary Foods:** The introduction of complementary foods when the infant reaches six months of age.
5. **Late Introduction of Complementary Foods:** The introduction of complementary foods after the infant has reached six months of age.
6. **Height-for-Age Z-score (HAZ):** The number of standard deviations an infant's measured length or height is above or below the median height for children of the same age and sex in the WHO Child Growth Standards.
7. **Stunting:** A condition in which an infant's height-for-age z-score is below minus two standard deviations from the median of the WHO Child Growth Standards. Infants with HAZ below -2 SD were classified as stunted, while those with HAZ equal to or above -2 SD were classified as not stunted (WHO, 2006).
8. **Appropriate Complementary Feeding Practices:** The introduction of safe, nutritionally adequate, and age-appropriate complementary foods at six months of age alongside continued breastfeeding.

9. **Inappropriate Complementary Feeding Practices:** The introduction of complementary foods before or after six months of age, or the provision of foods that are unsafe, nutritionally inadequate, or unsuitable for the infant's developmental age.

Abbreviation/Acronyms

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
BMC	BioMed Central
CF	Complementary Feeding
CHPS	Community-based Health Planning and Services
CHN	Community Health Nurse
CI	Confidence Interval
CWC	Child Welfare Clinic
DHS	Demographic and Health Survey
FAO	Food and Agriculture Organization of the United Nations
GDHS	Ghana Demographic and Health Survey
GHC	Ghana Cedis (currency)
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HAZ	Height-for-Age Z-score
ICF	International Classification of Functioning, Disability and Health
IYCF	Infant and Young Child Feeding
JHS	Junior High School
LBW	Low Birth Weight
OR	Odds Ratio
PI	Principal Investigator
SD	Standard Deviation
SDG	Sustainable Development Goal
SEM	Socio-Ecological Model
SHS	Senior High School
SSA	Sub-Saharan Africa
UNICEF	United Nations Children's Fund
WAZ	Weight-for-Age Z-score

WHO

World Health Organization

Abstract

Introduction: Malnutrition remains a major global public health concern, particularly among children under five years. Globally, 45 million children are wasted and 149 million are stunted, with over half of under-five deaths linked to malnutrition. Appropriate infant and young child feeding (IYCF) practices, especially complementary feeding (CF), are essential for improving child survival and growth outcomes. In Ghana, underweight, wasting, and stunting among infants are estimated at 10.4%, 5.3%, and 18.4%, respectively.

Methodology: A quantitative facility-based cross-sectional study was conducted among 328 caregivers of infants aged 6–24 months at Ho Teaching Hospital. Data were collected using a structured questionnaire and analyzed using descriptive statistics and inferential methods.

Results: More than half (54.27%) of caregivers introduced complementary feeding at six months, while 24.09% initiated early and 21.65% initiated late. Breastfeeding was widely practiced (96.04%), but only 30.18% adhered to exclusive breastfeeding for six months. Porridge was the most commonly introduced food (51.83%). The prevalence of stunting was 18.29%. Although stunting was lowest among infants introduced at six months, the association between timing of CF and stunting was not statistically significant ($p > 0.05$).

Conclusion: While timely CF is common, inappropriate timing persists. Timing alone does not significantly predict stunting, highlighting the importance of dietary quality and socio-economic factors. Interventions should focus on improving feeding practices and dietary quality.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Malnutrition remains a global public health concern, especially among children under five years of age (Zaheer et al., 2023). According to the WHO, (2023), approximately 45 million children globally suffer from wasting, while 149 million are stunted due to malnutrition. In addition, more than 50% of children under 5 years die each year from malnutrition (Zaheer et al., 2023). Poor infant feeding practices, especially during the first two years of life, are a major contributing factor to these outcomes (Budree et al., 2017). Inappropriate timing of complementary feeding, either too early or too late, compromises immunity, optimal growth and the overall development of infants. This thereby undermines progress towards Sustainable Development Goal (SDG) 2: Zero Hunger, which aims to end all forms of malnutrition by 2030 (Cheo & Tapiwa, 2021).

In order to achieve this global goal and improve child survival outcomes, national and international health frameworks emphasize the importance of appropriate infant and young child feeding (IYCF) practices. According to WHO, IYCF practices include breastfeeding and the timely introduction of appropriate complementary feeding (CF) (WHO, 2023). According to the WHO, “CF refers to the process of introducing solid or semi-solid foods to the diet of an infant alongside continued breastfeeding, typically around six months of age. Timing of introduction refers to the age at which these foods are first introduced, with “early” introduction occurring before six months and “late” introduction occurring after six months (Padhani et al., 2023). Infant nutritional status describes the overall health and development of an infant as influenced by the intake and utilization of nutrients (Abdullahi, 2021).

In Ghana, the Ministry of Health and the Ghana Health Service align with WHO recommendations, which advocate for exclusive breastfeeding during the first six months of life. After this period, timely introduction of safe and nutritionally adequate complementary foods is encouraged, while continuing breastfeeding for up to two years or beyond (Sika-Bright & Ahorlu, 2015). Despite these efforts, the prevalence of inappropriate CF practices remains a significant concern in the country.

For instance, the prevalence of appropriate CF practices was found to be as low as 29.8% among children aged 6–23 months in Northern Ghana (Saaka et al., 2022). Similarly, in the Volta Region, only 38.0% of mothers practiced appropriate CF (Appiah et al., 2017). Complementary feeding practices are closely linked to nutritional outcomes in children. In Ghana, the prevalence of underweight, wasting and stunting among infants was 10.4%, 5.3%, and 18.4%, respectively (Boah et al., 2019). Moreover, 33.8% of children in Northern Ghana were found to be malnourished, with regional disparities including 27.2% from the Northern region, 7.7% from the Upper East, and 6.8% from the Upper West (Glover-Amengor et al., 2016).

The appropriate timing of introducing complementary food is a key determinant of nutritional status among infants. Timely and adequate complementary feeding provides essential nutrients required for optimal growth and development. On the other hand, early introduction before six months can expose infants to infections and reduce breast milk intake, while late introduction can result in nutrient deficiencies and growth faltering (Hirvonen et al., 2024; Qasem et al., 2015). Studies have shown that malnutrition among infants often coincides with inappropriate complementary feeding patterns (Gebremedhin et al., 2024; Abeshu et al., 2016; Chlwuma et al., 2016; Victor et al., 2015; Saaka et al., 2015).

However, existing literature reveals important gaps. Most studies, particularly in Ghana, have examined complementary feeding practices using composite indicators such as minimum dietary diversity, meal frequency, and timing combined, rather than assessing the independent association between timing of complementary feeding and nutritional outcomes (Saaka et al., 2015; Saaka et al., 2022). In addition, a significant proportion of these studies are based on national surveys or with limited context-specific evidence from the Volta Region and the Ho Municipality. Furthermore, many studies adopt community-based approaches, with relatively few facility-based studies linking caregiver-reported timing of complementary feeding to objective measures of infant nutritional status such as stunting.

This study therefore sought to address these gaps by specifically examining the timing of introduction of complementary foods as a key exposure variable and its relationship with infant nutritional status in the Ho Municipality. By using facility-based data from caregivers attending the Child Welfare Clinic at Ho Teaching Hospital, this study provided context-specific evidence that contributes to a better understanding of how timing of complementary feeding is associated with infant growth outcomes in this setting.

1.2 Problem Statement

Poor infant and young child feeding (IYCF) practices during the first two years of life remain a significant contributor to malnutrition (Budree et al., 2017). Malnutrition continues to undermine global commitments such as Sustainable Development Goal 2 (Zero Hunger), which aims to eliminate all forms of malnutrition by 2030 (Cheo & Tapiwa, 2021). A key component of IYCF is the timely introduction of complementary feeding (CF), which provides the necessary nutrients required for optimal growth and development once exclusive breastfeeding alone is no longer sufficient (WHO, 2023).

In Ghana, national strategies promote exclusive breastfeeding for the first six months, followed by the timely introduction of appropriate complementary foods at six months (Sika-Bright & Ahorlu, 2015). Despite these efforts, adherence to recommended feeding practices remains suboptimal. For instance, only 29.8% of infants in Northern Ghana and 38.0% in the Volta Region receive appropriate complementary feeding (Saaka et al., 2022; Appiah et al., 2017). Evidence from the Ghana Demographic and Health Survey (GDHS 2022/23) indicates that although stunting among children under five has declined to about 17%, wasting (6%) and underweight (11%) remain persistent, with notable regional disparities (GSS, GHS & ICF, 2023; Glover-Amengor et al., 2016).

Beyond national averages, inappropriate feeding practices are more pronounced among specific groups of women. Early introduction of complementary feeding is more common among mothers with low educational attainment, those engaged in informal employment, and those influenced by cultural beliefs and family pressures (Saaka et al., 2022; Arhin, 2019). In addition, suboptimal breastfeeding practices, including early cessation of exclusive breastfeeding, remain a challenge in parts of Ghana, including the Volta Region, where misconceptions about breast milk adequacy and limited postnatal nutrition counselling contribute to inappropriate feeding decisions (Appiah et al., 2017; Nsiah-Asamoah et al., 2019). These practices increase infants' exposure to infections, reduce breast milk intake, and contribute to poor growth outcomes.

Research has established that the timing of complementary feeding is a critical determinant of infant nutritional status. Early introduction increases the risk of infections and reduces breast milk intake, while delayed initiation may result in nutrient deficiencies and growth faltering (Hirvonen et al., 2024; Qasem et al., 2015). However, most existing studies in Ghana have primarily examined general complementary feeding practices or composite IYCF indicators, rather than isolating the

specific role of timing as an independent factor influencing nutritional outcomes (Saaka et al., 2015; Saaka et al., 2022). Furthermore, available evidence is largely concentrated in selected regions, with limited context-specific and facility-based data from the Volta Region, particularly the Ho Municipality.

Although national infant and young child feeding guidelines recommend the introduction of complementary foods at six months, evidence indicates that inappropriate timing remains common in Ghana. Studies have reported low levels of appropriate complementary feeding in parts of the country, including Northern Ghana and the Volta Region, suggesting that many infants are introduced to complementary foods either before or after the recommended age (Appiah et al., 2017; Saaka et al., 2022). Early introduction may increase infants' exposure to contaminated foods, reduce breast milk intake, and heighten the risk of infections, while delayed introduction may result in inadequate energy and micronutrient intake during a critical period of growth (Qasem et al., 2015; Hirvonen et al., 2024). Despite this concern, there is limited evidence on the specific timing patterns of complementary feeding and their association with stunting among infants in the Ho Municipality. This local evidence gap limits the ability of health authorities and Child Welfare Clinics to develop context-specific nutrition counselling and feeding interventions.

Despite improvements in child nutrition indicators in Ghana, inappropriate timing of complementary feeding remains a public health concern. Evidence from Ghana shows that a considerable proportion of infants are introduced to complementary foods before or after the recommended age of six months, while appropriate complementary feeding practices remain low in parts of the country, including the Volta Region (Appiah et al., 2017; Saaka et al., 2022; GSS, GHS and ICF, 2023). A considerable proportion of infants are introduced to complementary foods either too early or too late, particularly among vulnerable groups of mothers, thereby increasing

the risk of infections, inadequate nutrient intake, and poor growth outcomes. In the Volta Region, where appropriate complementary feeding practices remain low, this problem is further compounded by suboptimal breastfeeding practices and limited context-specific evidence to guide interventions. Consequently, the extent to which the timing of complementary feeding influences infant nutritional status at the local level remains unclear.

Therefore, there is a need for context-specific, facility-based evidence to better understand how the timing of complementary feeding affects infant nutritional outcomes. This study seeks to address this gap by assessing the timing of introduction of complementary foods and its association with stunting among caregivers attending the Child Welfare Clinic at Ho Teaching Hospital.

1.3 Research questions

1. What is the timing of introduction of complementary foods among infants?
2. What are the most commonly introduced complementary foods among infants?
3. What is the proportion of infants experiencing stunting?
4. What is the association between the timing of introduction of complementary foods and stunting among infants?

1.4 General Objective

To assess the association between the timing of introduction of complementary foods and stunting among infants in the Ho Municipality, Volta Region, Ghana.

1.5 Specific Objectives

1. To assess the timing of introduction of complementary foods (early, timely, or late) among infants

2. To identify the most commonly introduced complementary foods for infants.
3. To determine the proportion of infants experiencing stunting.
4. To determine the association between early, timely, or late introduction of complementary foods and stunting among infants.

1.6 Justification of the study

This study is essential because inappropriate timing of complementary food introduction remains a significant public health concern. This contributes to poor nutritional outcomes among infants and undermines the progress toward SDG 2, which aims to end all forms of malnutrition by 2030. The WHO emphasizes the timely introduction of complementary foods at six months as an important intervention to support healthy growth and development. However, regional disparities in feeding practices and nutritional outcomes suggest that localized investigations are necessary to address this persistent challenge. To address this issue, this study aims to assess the association between the timing of introduction of complementary foods and stunting among infants in the Ho Municipality of Ghana. By focusing on this specific population and geographic area, the study will generate context-specific evidence to guide targeted public health strategies.

The Ho Teaching Hospital serves as the main referral facility in the Volta Region and provides routine child welfare services, including growth monitoring, immunization, and nutrition counselling, making it an appropriate setting to access caregivers of infants within the critical complementary feeding period. In addition, evidence indicates that complementary feeding practices in the Volta Region remain suboptimal (Appiah et al., 2017), yet there is limited facility-based data capturing actual caregiver practices and their relationship with infant nutritional outcomes. Caregivers attending the Child Welfare Clinic represent a key population for

intervention, as they are directly exposed to health education services and play a primary role in infant feeding decisions. Studying this group therefore provides an opportunity to generate actionable, context-specific evidence that can inform improvements in service delivery and nutrition counselling at the facility level.

Although prior studies have examined general IYCF practices in Ghana, limited empirical research has focused specifically on the timing dimension of CF and its direct association with infant nutritional status. The findings from this study will bridge this knowledge gap by providing evidence on feeding practices and their nutritional implications among infants in the Ho Municipality. The findings of this study may have important practical implications for health policy and program implementation. Identifying the relationship between early, timely, or late introduction of complementary foods and infant nutritional status will inform the design of more effective postnatal counselling and maternal education programs. Furthermore, identifying commonly introduced complementary foods will help guide recommendations for appropriate feeding. Ultimately, this research will contribute to the existing literature on complementary feeding practices in Ghana and inform national and local strategies aimed at improving infant nutrition and reducing the burden of child malnutrition.

1.7 Conceptual framework

This study is guided by the Socio-Ecological Model (SEM), which explains that health behaviours and outcomes are influenced by multiple interacting factors operating at different levels. The model is particularly relevant to infant feeding practices, as decisions regarding the timing of complementary feeding are shaped not only by caregiver knowledge but also by social influences and health system factors. In this study, these multilevel influences interact to determine the timing of complementary feeding, which subsequently affects infant nutritional outcomes, particularly

stunting. The Socio-Ecological Model traditionally comprises five levels of influence: individual, interpersonal, organizational (institutional), community, and policy levels. However, this study focuses on three key levels; individual, interpersonal, and institutional, because they are the most directly relevant to the study setting and available data.

Individual Level Factors

At the individual level, caregiver characteristics such as maternal education, knowledge of recommended feeding practices, and personal beliefs about infant nutrition play a critical role in determining when complementary foods are introduced. Caregivers with higher levels of education and better knowledge of infant feeding recommendations are more likely to initiate complementary feeding at the recommended age of six months. Conversely, limited knowledge or misconceptions such as the belief that breast milk alone is insufficient may lead to early or delayed introduction of complementary foods. Evidence from Ghana indicates that maternal education and knowledge are key determinants of appropriate complementary feeding practices (Saaka et al., 2022), highlighting the importance of individual-level factors in shaping feeding decisions.

Interpersonal Level Factors

At the interpersonal level, family dynamics, cultural beliefs, and social norms significantly influence infant feeding practices. In many settings, decisions about when to introduce complementary foods are not made by mothers alone but are shaped by advice from grandmothers, spouses, and other influential family members. Cultural beliefs regarding infant feeding—such as perceptions about the adequacy of breast milk or the appropriateness of certain foods—can encourage either early or delayed introduction of complementary feeding. Studies in Ghana have shown that social and cultural influences, including family pressure and traditional beliefs, contribute to inappropriate complementary feeding practices (Arhin, 2019). These interpersonal

influences may override formal health education, leading to practices that are inconsistent with recommended guidelines.

Institutional Level Factors

At the institutional level, access to and quality of health services play a crucial role in shaping caregiver practices. Child Welfare Clinics (CWCs) and other maternal and child health services serve as key platforms for delivering nutrition education and counselling on appropriate infant feeding practices. Effective postnatal counselling can improve caregivers' knowledge and promote timely initiation of complementary feeding. However, gaps in service delivery, including inadequate counselling, limited staff capacity, and high client load, may reduce the effectiveness of these interventions. Evidence suggests that inadequate postnatal nutrition counselling contributes to poor feeding practices among caregivers (Nsiah-Asamoah et al., 2019). Thus, institutional factors can either facilitate or hinder adherence to recommended feeding practices.

Link to Study Variables

Within this framework, the timing of complementary feeding (early, timely, or late) is the primary independent variable, influenced by factors operating at the individual, interpersonal, and institutional levels. This is examined in relation to infant nutritional status, specifically stunting, which is the dependent variable in this study. The model assumes that inappropriate timing of complementary feeding may be associated with adverse nutritional outcomes through mechanisms such as increased exposure to infections, reduced breast milk intake, and inadequate nutrient consumption (Hirvonen et al., 2024; Qasem et al., 2015). By situating the study within the Socio-Ecological Model, this research acknowledges that improving infant nutrition requires addressing not only individual-level factors but also broader social and health system influences.

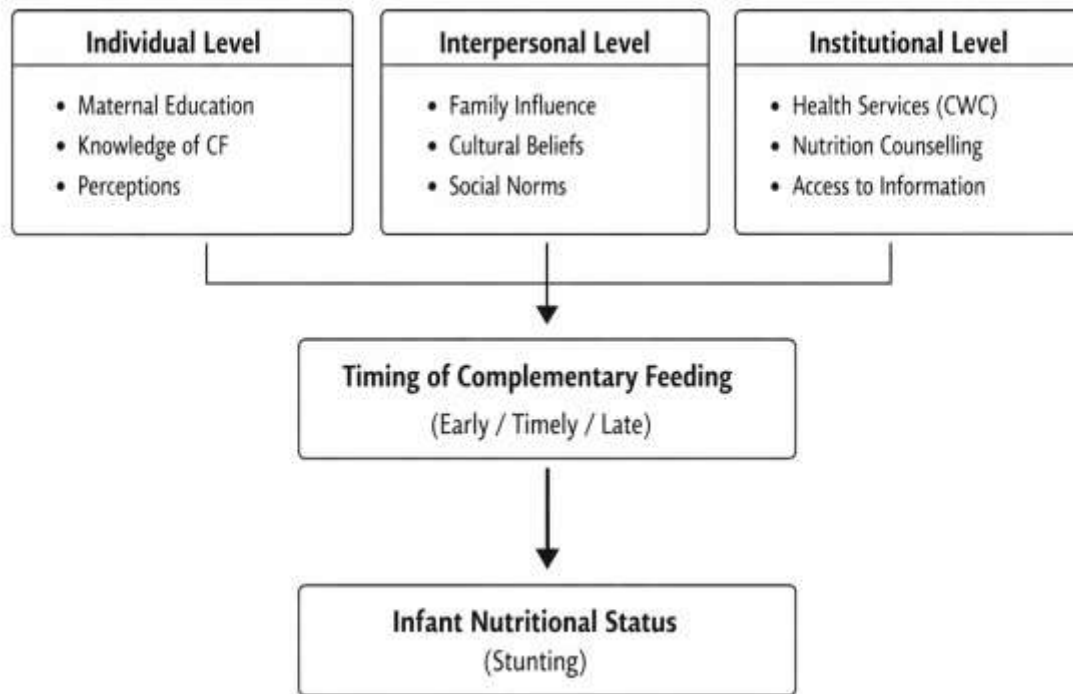


Figure 1.1 Conceptual Framework Based on the Social Ecological Model

Source: Adapted from the Social Ecological Model

1.8 Thesis Outline

This thesis is organised into six chapters. Chapter One presents the introduction to the study, including the background, problem statement, research questions, objectives, justification of the study, and conceptual framework. Chapter Two reviews relevant literature on complementary feeding practices, the timing of complementary feeding, nutritional status among infants, and the determinants of feeding practices, while highlighting the empirical gaps that justify the study. Chapter Three describes the methodology employed in conducting the study, including the study design, study setting, study population, sampling procedures, data collection methods, and ethical considerations. Chapter Four presents the findings of the study through descriptive and inferential analyses. Chapter Five discusses the findings in relation to existing literature and theoretical

perspectives. Finally, Chapter Six presents the conclusions drawn from the study and provides recommendations for policy, practice, and future research.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature on complementary feeding practices and their relationship with infant nutritional status. It begins by examining the concept of complementary feeding and its importance in child growth and development. The chapter further explores the types of complementary foods commonly introduced to infants, as well as the nutritional status of children within the complementary feeding period, with particular emphasis on stunting.

In addition, the chapter discusses the timing of introduction of complementary feeding and its influence on infant nutritional outcomes. It also examines the patterns and determinants of complementary feeding practices, including individual, socio-cultural, and health system factors. Finally, the chapter synthesizes the empirical gaps identified in the literature to justify the need for the present study.

2.2 Description of complementary feeding

Complementary feeding constitutes one of the most critical phases in child survival and development because, from six months of age, breast milk alone can no longer meet the increasing nutritional requirements of infants (World Health Organization [WHO], 2023). The period between 6 and 24 months has been widely described as a window of vulnerability during which growth faltering, micronutrient deficiencies, and infections commonly occur when feeding practices are inadequate (UNICEF, 2022). Globally, it is estimated that inappropriate infant and young child feeding contributes to nearly half of deaths among children under five years, largely through its interaction with malnutrition and infectious diseases (Black et al., 2021). Consequently, international guidelines emphasize that complementary foods should be introduced at six months,

be nutritionally adequate, safe, and provided alongside continued breastfeeding up to two years or beyond (WHO, 2023). In many low-resource settings, however, caregivers often face practical challenges in applying these recommendations, including limited access to diverse foods, conflicting advice from family members, and uncertainty about when breast milk alone becomes insufficient.

In sub-Saharan Africa, adherence to recommended complementary feeding practices shows considerable variation across countries and communities. While policy and programmatic efforts have led to improvements in infant feeding practices, challenges remain in achieving optimal complementary feeding, particularly during the transition from exclusive breastfeeding. UNICEF (2022) and Issaka et al. (2021) report that about one-third of children aged 6–23 months achieve minimum dietary diversity, while many infants are exposed to either early or late initiation of complementary foods. These practices are shaped by intersecting socioeconomic and cultural factors including poverty, maternal education, food insecurity, and traditional beliefs regarding infant digestion (Mekonnen and Bekele, 2020). The consequences are reflected in the persistently high burden of undernutrition across the region, where underweight and wasting continue to affect millions of children (FAO et al., 2023).

Ghana reflects this broader regional challenge. Although national infant and young child feeding strategies align with WHO recommendations, evidence shows that appropriate complementary feeding practices remain low in many parts of the country (Ghana Statistical Service [GSS], 2023). National survey data indicate that only a minority of infants aged 6–23 months receive diets that meet minimum acceptable standards, while regional disparities persist between northern and

southern Ghana (GSS, 2023; Saaka et al., 2022). Nutritional outcomes among Ghanaian infants also remain concerning, with underweight, wasting, and emerging overweight documented among children under two years (Boah et al., 2019; GSS, 2023). These outcomes are commonly assessed using the WHO weight-for-age z-score (WAZ), a composite indicator reflecting both acute and chronic nutritional deprivation (WHO, 2006).

Although several studies in Ghana have explored breastfeeding and general infant feeding behaviours, fewer investigations have specifically examined the timing of complementary food introduction and its direct relationship with measured nutritional status at municipal or facility level.

2.3 Most Commonly Introduced Complementary Foods

The types of foods offered to infants at the onset of complementary feeding are fundamental determinants of dietary adequacy and subsequent growth. International guidelines recommend that first foods should be rich in energy, protein, and essential micronutrients, particularly iron and zinc, while being developmentally appropriate in texture and frequency (WHO, 2023). However, global evidence shows that in many low- and middle-income countries, diets are dominated by monotonous, cereal-based foods with low nutrient density (UNICEF, 2022). Such diets often fail to meet the physiological requirements of rapidly growing infants and contribute to widespread micronutrient deficiencies (Victora et al., 2021).

Across sub-Saharan Africa, cereal porridges prepared from maize, millet, or sorghum constitute the most common first complementary foods. Studies from Ethiopia, Tanzania, Nigeria, and Kenya consistently report reliance on thin gruels that are affordable and culturally familiar but low in bioavailable iron and protein (Kulwa et al., 2019; Dhami et al., 2020). The frequent dilution of these porridges further reduces their energy density, increasing the risk of inadequate intake even

when feeding frequency is adequate (Abeshu et al., 2016). Introduction of animal-source foods, fruits, and vegetables remains limited due to cost barriers, seasonal availability, and caregiver perceptions that such foods are unsuitable for young infants (Mekonnen and Bekele, 2020).

Evidence from Ghana reveals comparable patterns with context-specific variations. Multiple studies identify maize porridge (koko), roasted maize–groundnut blend with soy bean (tom brown), mashed family staples such as rice and yam, and commercial infant cereals as the predominant first foods (Saaka et al., 2022; Issaka et al., 2021). While these foods are often introduced alongside continued breastfeeding, their nutritional quality is highly variable. Research in northern Ghana demonstrated that many caregivers prepare porridges with high water content and minimal protein enrichment, resulting in diets deficient in iron and essential amino acids (Saaka et al., 2022). Similar findings from southern Ghana indicate that although commercial cereals are perceived as superior, their high cost limits consistent use among low-income households (Appiah et al., 2017).

Maternal knowledge and health service exposure significantly influence the choice of complementary foods in Ghana. Caregivers who receive counselling at child welfare clinics are more likely to introduce enriched porridges containing groundnuts, fish powder, or legumes, whereas those relying on family advice often maintain cereal-only diets (Nsiah-Asamoah et al., 2019). Educational attainment and household income further shape food selection, with poorer households depending largely on inexpensive staples produced at home (Issaka et al., 2021). Cultural beliefs also remain influential; qualitative studies report avoidance of eggs and fish due to fears of delayed speech or illness, despite lack of biomedical evidence (Arhin, 2019).

Notwithstanding these insights, important gaps persist within the Ghanaian literature. Many studies assess complementary foods using dietary diversity indicators without linking specific first foods to objectively measured nutritional outcomes such as WAZ. Furthermore, evidence from the Volta Region and the Ho Municipality is particularly scarce, with limited facility-based documentation of what caregivers actually introduce to infants attending child welfare clinics. Understanding the dominant complementary foods within this local context, and how they may relate to infant nutritional status, is therefore essential for context-appropriate interventions.

2.3 Nutritional Status of Infants 6–24 Months

Globally, malnutrition among infants and young children continues to represent a major threat to child survival and human capital development. Undernutrition has been identified as an underlying factor in nearly half of all deaths among children under five years, largely through its interaction with infectious diseases and impaired immunity (Black et al., 2021). Among the commonly used indicators, weight-for-age z-score (WAZ) remains particularly important because it captures both acute and chronic nutritional deprivation and is strongly predictive of morbidity and mortality in early childhood (WHO, 2006). Despite gradual improvements in some regions, global progress has been uneven, and millions of children still experience growth faltering during the complementary feeding period (UNICEF, 2023).

The burden of undernutrition is most pronounced in sub-Saharan Africa, where socioeconomic vulnerability, food insecurity, and weak health systems continue to undermine optimal child growth. Recent global assessments indicate that the region carries a disproportionate share of the world's underweight and wasted children, with rates remaining considerably higher than global averages (FAO et al., 2023). These outcomes are shaped by multiple interacting determinants including inadequate dietary intake, recurrent infections, poor water and sanitation, and limited

access to quality maternal and child health services (Khara et al., 2021). Although some countries have recorded modest declines in stunting, underweight and wasting among infants aged 6–24 months remain persistent public health concerns across many parts of the region (UNICEF, 2023). Ghana reflects both the progress and the continuing challenges observed across sub-Saharan Africa. The Ghana Demographic and Health Survey (DHS) 2022/23 reports that underweight remains a significant problem among children under two years, with national prevalence in the mid-teens and marked regional disparities (GSS, 2023). The survey further indicates that wasting affects approximately five to seven percent of young children, signalling ongoing exposure to acute nutritional stressors such as illness, poor feeding, and seasonal food shortages (GSS, 2023). These national figures, while improved compared with earlier decades, demonstrate that a substantial proportion of Ghanaian infants still fail to achieve adequate growth during the complementary feeding period.

Regional variations within Ghana are particularly striking. Northern regions consistently record higher levels of stunting than southern regions, reflecting differences in poverty levels, food production, maternal education, and access to health services (GSS, 2023). Nonetheless, undernutrition is not confined to the north. Evidence from facility-based settings in southern Ghana shows that significant proportions of infants attending child welfare clinics are stunted, often exceeding the estimates generated by household surveys (Yeboah et al., 2021). Such findings suggest that community surveys may underestimate the true burden of malnutrition among children who interact regularly with the health system, including those in urban and peri-urban municipalities.

Overall, the available evidence demonstrates that the nutritional status of infants aged 6–24 months in Ghana remains fragile. National DHS data confirm continuing levels of underweight and

wasting, while facility-based studies reveal even higher prevalence among children accessing routine health services (GSS, 2023; Yeboah et al., 2021). These patterns underscore the importance of localised assessments using objective anthropometric indicators such as WAZ to better understand the magnitude of the problem within specific municipalities. In the context of the Ho Municipality, where disaggregated data are limited, examining infant nutritional status in relation to complementary feeding practices is therefore both timely and necessary.

2.4 Timing of Complementary Feeding and Nutritional Status

International guidelines recommend that complementary feeding should begin at six months of age, when breast milk alone is no longer sufficient to meet the infant's increasing energy and micronutrient requirements (WHO, 2023). Introduction before this period may displace breast milk and expose infants to contaminated foods, while delayed initiation after six months can result in nutrient deficits and growth faltering (Victora et al., 2021). These biological pathways provide the conceptual basis for understanding why deviations from the recommended timing are frequently associated with poor anthropometric outcomes.

Global evidence consistently shows that early introduction of complementary foods is associated with an increased risk of undernutrition and illness (White et al., 2020; Smith and Becker 2022). A multi-country analysis using Demographic and Health Survey data from 57 low- and middle-income countries found that infants introduced to complementary foods before six months had significantly higher odds of being underweight and wasted compared with those introduced at six months (White et al., 2020). Early initiation was also associated with higher incidence of diarrheal disease, which in turn mediated weight loss and impaired nutrient absorption. Similar findings were reported in a systematic review by Smith and Becker (2022), which concluded that early

complementary feeding is often driven by maternal perceptions of insufficient breast milk and pressure from family members rather than by the infant's physiological readiness.

Conversely, delayed introduction of complementary foods has been shown to carry its own risks. Studies from South Asia and East Africa indicate that infants who begin complementary feeding after seven months often experience iron and zinc deficiencies, as breast milk becomes inadequate to meet micronutrient needs beyond the middle of infancy (Lutter and Dewey, 2021). Such delays are commonly observed in contexts where exclusive breastfeeding is strongly promoted without parallel emphasis on timely transition to diverse family foods. The resulting period of nutritional insufficiency may manifest as declining weight-for-age trajectories during the second half of infancy.

Within sub-Saharan Africa, the relationship between timing of complementary feeding and nutritional status has been documented across diverse settings [⚠ FLAG – Steve Manortey: Please insert the correct citation/reference here to support this statement.]. An analysis of pooled DHS data from 15 African countries revealed that timely initiation at six months was protective against underweight, whereas both early and late introduction were associated with poorer WAZ scores (Issaka et al., 2021). The authors emphasised that the effect of timing was partly mediated by the quality of foods offered, highlighting that appropriate timing alone is insufficient when diets remain monotonous and low in nutrient density. This observation is particularly relevant in West African contexts where first foods are predominantly cereal-based and often inadequately enriched.

Evidence from Ghana largely mirrors these regional patterns. National surveys show that a substantial proportion of infants are introduced to complementary foods either before or after the recommended age, reflecting gaps in caregiver knowledge and health system counselling (GSS,

2023). Facility-based research in southern Ghana provides insight into this relationship. Yeboah et al. (2021) found that among infants attending child welfare clinics, those whose caregivers reported late initiation of complementary feeding had significantly lower mean WAZ scores than those introduced at 6 months. The study highlighted that many caregivers delayed introduction due to misconceptions that breast milk remained fully adequate beyond six months, or due to fear that family foods were too “heavy” for the infant. These findings demonstrate that both forms of mistiming—early and late—can adversely influence nutritional status through different mechanisms.

Despite the growing body of evidence, several methodological limitations remain within the literature. Many studies rely on maternal recall of the age of introduction, which may be subject to heaping at six months and social desirability bias (White et al., 2020). Cross-sectional designs also limit causal inference, as poor growth may itself influence caregiver feeding decisions. Furthermore, relatively few Ghanaian studies have examined timing specifically in relation to objectively measured WAZ within municipal or facility contexts, leaving uncertainty about how national patterns translate to local realities such as those in the Ho Municipality.

In summary, the timing of complementary feeding represents a pivotal factor in shaping infant nutritional status. Global and regional evidence indicates that initiation before or after six months is frequently associated with poorer weight-for-age outcomes, while timely introduction offers a protective effect when accompanied by adequate diet quality. Ghanaian studies support this relationship but remain limited in geographic scope and methodological depth. These gaps underscore the need for context-specific research that links caregiver-reported timing with

measured anthropometric status among infants accessing routine health services in the Ho Municipality.

2.5 Relationship Between Timing of Complementary Feeding and Stunting

A growing body of evidence suggests that the timing of complementary feeding plays an important role in shaping infant nutritional outcomes, particularly stunting. The introduction of complementary foods either before or after the recommended age of six months has been associated with impaired growth, although the magnitude and direction of this relationship vary across settings and populations. The World Health Organization recommends the introduction of complementary foods at six months because breast milk alone becomes insufficient to meet the increasing nutritional requirements of infants beyond this age (WHO, 2023).

Early introduction of complementary foods before six months may expose infants to contaminated foods and water, increase the risk of diarrhoeal diseases, and reduce breast milk intake, thereby negatively affecting growth and nutritional status (Qasem et al., 2015). A systematic review by Smith and Becker (2022) found that infants introduced to complementary foods before six months had significantly higher odds of poor growth outcomes compared with those introduced at the recommended age. Similarly, pooled analyses of Demographic and Health Survey data from low- and middle-income countries showed that early initiation of complementary feeding was associated with increased odds of undernutrition and growth faltering (White et al., 2020).

Delayed introduction of complementary foods after six months has also been linked with adverse nutritional outcomes. Beyond six months of age, breast milk alone cannot adequately meet an infant's energy and micronutrient requirements, particularly for iron, zinc, and protein (Lutter and Dewey, 2021). Consequently, delayed initiation may contribute to nutrient deficiencies and poor linear growth. Studies conducted in East Africa reported significantly higher levels of stunting

among infants who received complementary foods later than the recommended age (Gebremedhin et al., 2024).

Evidence from sub-Saharan Africa generally supports the existence of a relationship between inappropriate timing of complementary feeding and poor nutritional outcomes. Issaka et al. (2021), using pooled DHS data from fifteen African countries, reported that timely introduction of complementary foods at six months was associated with improved nutritional outcomes, whereas both early and late introduction were associated with poorer anthropometric indicators. However, the authors noted that the quality and diversity of complementary foods often modified this relationship.

Studies conducted in Ghana show similar trends. Saaka et al. (2015) reported that inappropriate complementary feeding practices were associated with poorer nutritional outcomes among children in Northern Ghana. Likewise, Yeboah et al. (2021) observed that infants introduced to complementary foods outside the recommended six-month window had poorer growth indicators compared with infants who received timely complementary feeding. Nevertheless, much of the available Ghanaian evidence focuses on composite infant and young child feeding indicators rather than examining timing as an independent exposure variable.

Despite these findings, the evidence remains inconsistent. Some studies have reported weak or non-significant associations after adjusting for socioeconomic factors, dietary quality, infections, and maternal characteristics (White et al., 2020). This suggests that while timing is important, it may operate alongside several other determinants of infant growth and nutritional status.

The limited availability of facility-based and context-specific studies from the Volta Region, particularly the Ho Municipality, highlights the need for further investigation into the relationship between the timing of complementary feeding and stunting. Understanding this relationship within

the local context will provide evidence to guide nutrition counselling and infant feeding interventions in the municipality.

2.6 Timing Patterns and Determinants of Introduction

The decision on when to introduce complementary foods is rarely based solely on biomedical recommendations; rather, it reflects a complex interaction of maternal knowledge, household circumstances, sociocultural norms, health-system influences, and the broader food environment (Arhin, 2019). The food environment plays an important role in shaping caregiver choices. In Ghana, the relatively high cost of commercial infant formulas and processed complementary foods may limit their use among low-income households, while in other settings, greater affordability and marketing strategies may encourage earlier introduction of such products. These economic and contextual influences operate alongside maternal knowledge, cultural beliefs, and social pressures, which have been shown to affect complementary feeding practices (Saaka et al., 2022; Arhin, 2019). As a result, caregiver decisions regarding the timing and type of complementary foods introduced are shaped by both immediate social contexts and broader structural factors.

Globally, studies have shown that although many caregivers are aware of the six-month recommendation, actual practices frequently diverge due to competing pressures such as perceived breast-milk insufficiency, maternal employment, and advice from older relatives (WHO, 2023; Smith and Becker, 2022). These factors operate within broader structural environments marked by poverty and food insecurity, which are consistently associated with suboptimal infant feeding behaviours (UNICEF, 2023).

Across sub-Saharan Africa, maternal education has been identified as one of the strongest predictors of timely complementary feeding. Analysis of DHS data demonstrate that mothers with

secondary or higher education are significantly more likely to introduce complementary foods at six months compared with those with no formal education (Issaka et al., 2021). Education is believed to enhance understanding of infant nutritional needs and strengthen caregivers' ability to negotiate family pressures that promote early feeding. Household economic status also shapes timing decisions, as financial hardship is frequently linked with earlier introduction of family foods and difficulties sustaining recommended feeding practices (FAO et al., 2023).

Cultural beliefs and intergenerational norms further influence when complementary foods are initiated. Qualitative evidence from Ghana describes how grandmothers and other influential relatives often encourage early feeding with water, herbal preparations, or thin porridges based on the perception that breast milk alone does not satisfy the infant (Arhin, 2019). In other settings, delayed introduction is common due to fears that solid foods will cause abdominal discomfort or that the infant is not yet developmentally ready to digest them (Mekonnen and Bekele, 2021). Such perceptions frequently outweigh messages delivered by health workers, particularly when counselling at clinics is brief or lacks practical demonstrations.

Health-system factors therefore constitute a critical layer of influence on timing practices. Regular attendance at child welfare clinics and exposure to structured nutrition counselling have been associated with more appropriate initiation of complementary feeding in Ghana (Nsiah-Asamoah et al., 2019). Nevertheless, the quality of counselling varies widely between facilities, with heavy client loads, limited staff training, and shortages of educational materials reducing opportunities for individualised guidance (UNICEF, 2023). These gaps can leave caregivers uncertain about the correct timing once the infant approaches six months.

In Ghana, national evidence reflects the interaction of these determinants. The Ghana Demographic and Health Survey 2022/23 indicates that mistiming of complementary feeding is

more common among younger mothers, those with limited education, and women engaged in informal employment that constrains time for breastfeeding (GSS, 2023). Studies from northern Ghana similarly report that pressure from relatives, early return to work, and perceptions of insufficient breast milk encourage introduction of foods before six months (Saaka et al., 2022). Conversely, some caregivers delay initiation because health messages on exclusive breastfeeding are interpreted as implying that breast milk remains fully adequate beyond six months (Yeboah et al., 2021).

The broader food environment also shapes caregiver choices. UNICEF (2023) and the World Health Organization monitoring of the International Code of Marketing of Breast-milk Substitutes highlight that aggressive promotion of commercial infant foods in many low- and middle-income countries can undermine recommended timing by presenting such products as suitable for infants younger than six months (WHO, 2022). Where regulation and counselling are weak, caregivers may rely on marketing messages rather than professional guidance when deciding when to begin complementary feeding.

Despite increasing understanding of these influences, evidence from the Volta Region and specifically the Ho Municipality remains limited. Most Ghanaian studies have been conducted in northern regions or large metropolitan areas, with few facility-based investigations exploring how local beliefs, work patterns, and clinic experiences shape timing decisions. This lack of context-specific information constrains the design of targeted behaviour-change interventions within municipal child welfare clinics. Empirical assessment of caregivers in the Ho Municipality is therefore required to identify the dominant determinants of early, timely, and late initiation of complementary feeding.

2.7 Synthesis of Empirical Gaps and Justification for the Study

The review of global, regional, and Ghanaian literature demonstrates substantial progress in understanding complementary feeding practices, yet several critical gaps remain. At the global level, there is broad consensus that both early and late introduction of complementary foods are associated with adverse nutritional outcomes, particularly poor weight-for-age trajectories (Victora et al., 2021; White et al., 2020). However, much of this evidence is derived from large multi-country surveys that prioritise breadth over contextual depth. Such studies provide valuable national and regional patterns but are less able to capture the local realities that shape caregiver behaviour within specific municipalities and health facilities.

Within sub-Saharan Africa, existing research has focused largely on identifying determinants of inappropriate feeding, including maternal education, poverty, and cultural beliefs (Issaka et al., 2021; FAO et al., 2023). While these studies illuminate important structural influences, fewer investigations have directly linked the timing of complementary feeding with objectively measured nutritional status using weight-for-age z-scores in routine service settings. Many analyses rely on dietary diversity indicators or caregiver self-report without corresponding anthropometric verification, limiting the ability to establish how timing decisions translate into measurable growth outcomes.

The Ghanaian literature reflects similar limitations. National surveys such as the Ghana DHS 2022/23 provide important prevalence data on underweight and on age at introduction of complementary foods (GSS, 2023). Nevertheless, these datasets are cross-sectional and not designed to explore detailed relationships between timing categories—early, timely, and late—and infant WAZ at the municipal level. Existing Ghanaian studies that have examined this relationship have been concentrated mainly in northern regions or large urban centres (Saaka et

al., 2022; Yeboah et al., 2021). Consequently, evidence from the Volta Region, and particularly from the Ho Municipality, remains extremely limited.

Health-system research also reveals unanswered questions. Counselling at child welfare clinics is recognised as a key influence on caregiver decisions (UNICEF, 2023), yet little is known about how caregivers attending facilities in the Ho Municipality interpret and apply these messages. The extent to which local counselling practices, caregiver employment patterns, and family pressures shape timing in this context has not been adequately documented. This limits the capacity of municipal health managers to design targeted, evidence-based behaviour-change strategies.

Methodologically, many prior studies depend on maternal recall of the age at which foods were introduced, a measure prone to heaping at six months and social desirability bias (White et al., 2020). Facility-based research that combines caregiver interviews with direct anthropometric assessment offers an opportunity to strengthen the evidence base by reducing such biases. Yet few investigations in Ghana have adopted this approach within routine child welfare clinic settings.

Taken together, these gaps justify the present study. There is a clear need for context-specific evidence from the Ho Municipality that simultaneously examines the timing of complementary food introduction, the types of foods offered, and the resulting nutritional status measured by WAZ. By focusing on caregivers attending the Ho Teaching Hospital Child Welfare Clinic, the study will generate practical insights directly relevant to service delivery. The findings will contribute to national discussions on infant nutrition while providing local health authorities with data to refine counselling messages and interventions aimed at preventing both undernutrition and emerging overnutrition among infants.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This section outlines the approaches that was used to conduct this study in the Ho Municipality. This chapter includes sections such as the description of the study site, sampling procedure, sample size, data collection instrument and procedure, ethical issues, expected outcome and the proposed timeline and budget.

3.2 Study Design

This study utilized a quantitative research approach. Specifically, the study was a facility-based cross-sectional study. This study design was used because the study was carried out in a health facility with a defined population. In addition, this design was selected because it uses minimal time and it is less expensive.

3.3 Study Site

Ho Municipality is situated in the central part of Ghana's Volta Region. The Municipality was established in 2012 through Legislative Instrument (L.I.) 2074 (Ministry of Finance, 2015). It is one of the 25 administrative Districts in the Volta Region, Ghana. The Municipality's administrative and economic centre is the town of Ho, which also serves as the regional capital. Geographically, Ho Municipality lies between latitudes 6°20'N and 6°55'N and longitudes 0°12'E and 0°53'E. It shares boundaries with Adaklu and Agotime-Ziope Districts to the south, Ho West District to the north and west, and the Republic of Togo to the east. Covering a land area of approximately 2,361 square kilometres. The municipality accounts for about 11.5% of the total land area in the Volta Region. According to the 2021 Population and Housing Census conducted,

Ho Municipality has a total population of 180,420, comprising 84,843 males and 95,577 females (GSS, 2021).

The Ho Municipality in Ghana's Volta Region faces significant maternal and child health challenges, highlighting the need for targeted nutritional interventions. Notably, the municipality exhibits the highest prevalence of low birth weight (LBW) in the region, with rates reaching 12.9% between 2019 and 2023 (Doe et al., 2022). This condition is particularly prevalent among multiparous mothers, underscoring potential intervention targets (Smith & Adu, 2021).

In addition to LBW, the municipality faces challenges in immunization coverage. Some health facilities exhibit inconsistencies in data reporting, including overreporting or underreporting of vaccine administration figures to the Municipal Health Directorate. For instance, discrepancies were observed in which one facility overreported Penta 3 vaccinations by 8 doses while underreporting Measles 2 by 16 doses (Kofi et al., 2020).

Complementary feeding practices for children aged 6–24 months are suboptimal. Studies indicate that only 13% of Ghanaian children in this age group receive a minimum acceptable diet, with many lacking dietary diversity and adequate meal frequency (Agyeman et al., 2021). Appropriate complementary feeding is critical during this period to support rapid growth and development (Mensah et al., 2020).

Given these challenges, studying complementary feeding practices in the Ho Municipality is imperative. Addressing this issue could significantly improve child health outcomes, potentially reducing LBW incidence and supporting optimal growth and development (Doe et al., 2022; Agyeman et al., 2021).

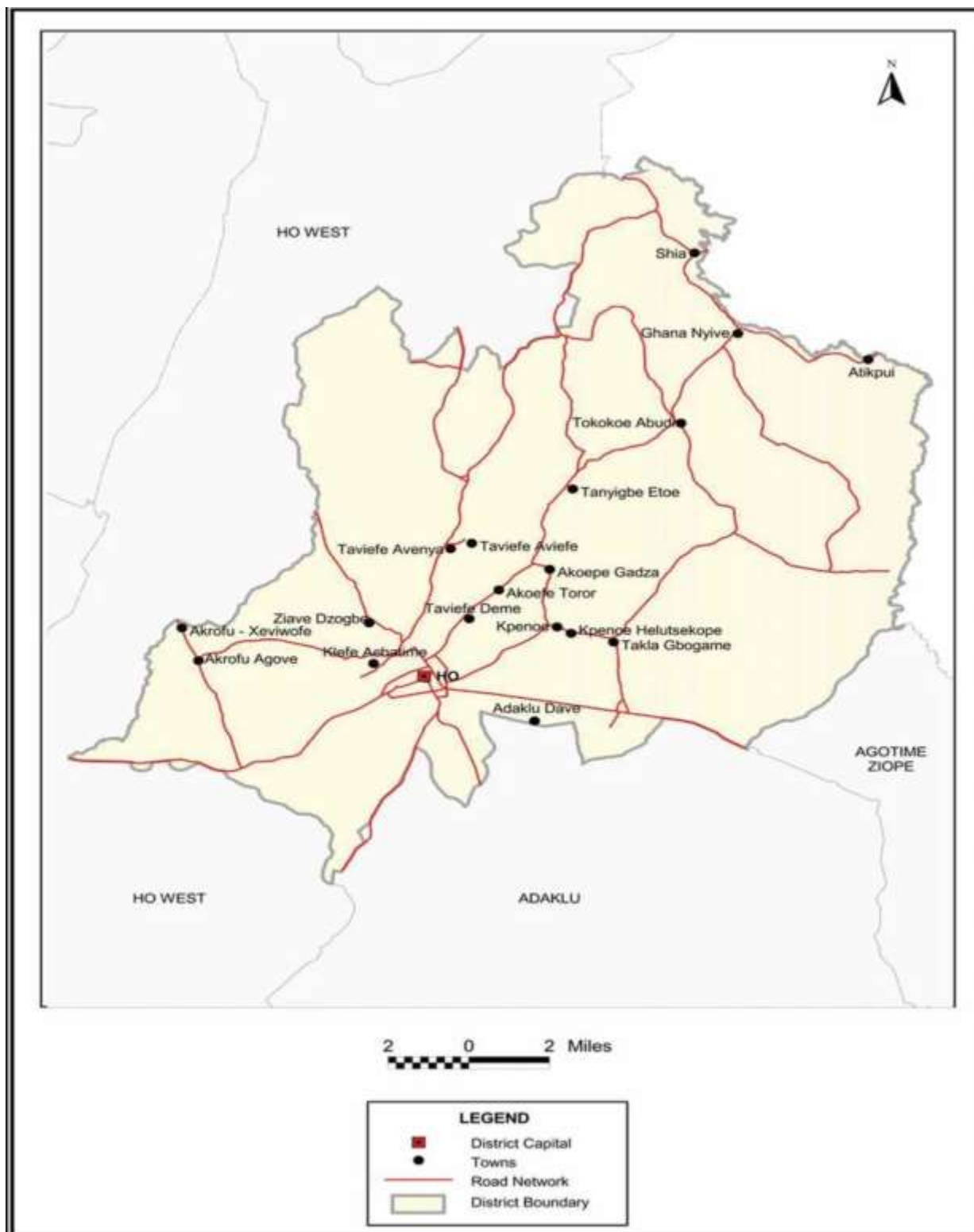


Figure 3.2 Map of Ho Municipal

Source: (GSS, 2021)

3.4 Study Population

This study included care givers of infants aged 6 – 24 months who attend CWC at the Ho Teaching Hospital. Caregivers attending the CWC were selected because the clinic serves as a primary point of contact for routine child health services, including growth monitoring, immunization, and nutrition counselling. This makes it an appropriate setting to access caregivers within the complementary feeding period and obtain reliable information on infant feeding practices and nutritional status. Additionally, the use of a facility-based population ensures that anthropometric measurements are conducted using standardized procedures, thereby improving the accuracy of nutritional assessment

3.5 Eligibility Criteria

3.5.1 Inclusion Criteria

1. The caregiver must have been living in Ho Municipality for at least the past six months to ensure familiarity with local feeding practices.
2. Caregivers must be 18 years or older.

3.5.2 Exclusion Criteria

1. Infants who are acutely ill at the time of data collection.
2. Infants who have any known congenital or chronic condition (e.g., cleft palate, cerebral palsy, or metabolic disorders) that affects feeding or growth.
3. Infants who are not primarily fed by the caregiver being interviewed.

3.6 Sampling Techniques

A cross-section of the study population was selected using a probability simple random sampling technique. This technique enables all study participants to have an equal chance of being selected

for the study. This technique was used because it enables the achievement of a greater degree of representativeness. The sample frame was the list of all caregivers who attend CWC clinic at the Ho Teaching Hospital. From the sample frame, the caregivers were numbered from 1 to 328. A sequence of n random numbers between 1 and N was generated using a random number table (Microsoft Excel). If a number selected has been picked already, it will be ignored and another number will be selected. This randomization will be done until the sample size is reached.

The sample size for this study will be calculated using the Cochran formula.

$$n = \frac{Z^2 \times (1 - P)}{d^2}$$

Where;

n = Sample size,

Z = Z-score (1.96 at 95 % confidence interval)

p = (proportion)

d = (margin of error).

The sample size was estimated using a stunting prevalence of 18.4% among children in Ghana because stunting was the primary outcome of the study (Boah et al., 2019). Using Cochran's formula, a 95% confidence level ($Z = 1.96$), a 5% margin of error, and $p = 0.184$ produced a minimum sample size of 231 participants.

$$n = \frac{Z^2 \times (1 - P)}{d^2}$$

$$n = \frac{1.96^2 \times (1 - 0.298)}{0.05^2}$$

$$n = 321.4$$

After allowing for a 5% non-response rate, the minimum required sample size was 243.

However, the larger achieved sample of 328 caregivers was retained because it increased the precision of the estimates and the statistical power of the analysis.

3.7 Data Collection Instrument and Procedure

A structured questionnaire was used for this study. Structured interview questions allow researchers to easily compile data for statistical analysis (Creswell, 2012). The questionnaire was divided into 5 subsections as follows:

Section A: Sociodemographic Factors

This section gathers background information on the caregiver, including age, relationship to the child, educational level, marital status, employment status, religion, and household income. These variables help describe the study population.

Section B: Infant Information

Questions in this section cover the infant's sex, age, and birth history (including whether the child was born prematurely).

Section C: Feeding Practices

This section explores infant feeding history, particularly breastfeeding and the introduction of complementary foods. Specific questions include whether the child was ever breastfed, duration of exclusive breastfeeding, age at introduction of complementary feeding, and the type of foods introduced. It also asks whether breastfeeding continued after complementary feeding began and caregivers' perceptions of the adequacy of the food provided.

The questionnaire captured porridge as a general food category but did not collect information on the specific type of porridge or the ingredients used in its preparation. Porridge was therefore analysed and reported as a broad category.

Section D: Infant's Nutritional Status

This section records the infant's length or height and age, which were used to compute height-for-age z-scores and classify stunting using the WHO Child Growth Standards. Anthropometric measurements were taken using standard equipment and procedures.

Section E: Maternal Knowledge on Complementary Feeding

This section assesses caregivers' knowledge and awareness of appropriate complementary feeding practices. It includes questions on the recommended age for introducing complementary foods, knowledge of what constitutes appropriate feeding and perceived effects of early or late introduction.

A structured questionnaire was used to collect data at a single point in time from caregivers of infants who consent to participate in the study. Data collection was carried out by the principal investigator (PI). The questionnaire was administered by the interviewer through face-to-face interviews using Kobo collect on tablets or mobile devices to ensure efficient data entry and storage. Each participant was interviewed privately and in person within the premises of the Ho Teaching Hospital. Prior to the commencement of data collection, the PI met with the hospital management and CWC staff to explain the objectives of the study and to seek their approval, cooperation and support.

Data collection took place over a one-month period. Interviews were conducted on weekdays (Monday to Friday) between 8:00 AM and 2:00 PM, aligning with the clinic's operating hours

when caregivers are most likely to be present. Each interview lasted approximately 15 to 20 minutes. During the data collection process, every question was clearly explained to the participants in a language they understood, Ewe and English primarily, to ensure clarity and avoid misinterpretation.

3.8 Pretesting

The questionnaire was pre-tested prior to the actual data collection to assess its relevance, clarity and cultural appropriateness. Feedback from the pre-test was used to make necessary adjustments to improve the flow, accuracy and contextual fit of the questions. The pretesting exercise was conducted at the Hohoe Municipal Hospital, which also offers Child Welfare Clinic (CWC) services and is located in the Volta Region. This facility shares similar characteristics with the study site but is outside the primary data collection area, ensuring that pretesting does not interfere with the main sample.

3.9 Data Handling and Analysis

Data extracted from the Kobo Collect was exported into Microsoft Excel for data cleaning. The data was checked for duplication, error and missing data. The data was finally exported into Stata version 19 for data analysis. Frequencies and percentages were used to describe categorical variables, including caregiver sociodemographic characteristics (age group, educational level, marital status, employment status, and religion), infant characteristics (sex and age group), feeding practices (timing of complementary feeding, type of complementary food introduced, exclusive breastfeeding duration, and source of feeding information), and nutritional status (stunting). Means and standard deviations were used to summarise the continuous variables. Binary logistic regression analysis was used to estimate odds ratios and determine the association between early, timely, or late introduction of complementary foods and stunting. The findings were interpreted as

statistical associations rather than causal effects. All tests with p-values below 0.05 were considered statistically significant at the 95% confidence level. The results were presented in tables and charts.

Hard copies of collected questionnaires were stored in a cabinet with only one key for safekeeping. Transcribed soft copies of the data was kept on an encrypted hard drive. An iCloud backup was also made on my personal account. Data will be kept for up to 3 years after the research to allow referencing when needed.

3.10 Dissemination of Results

The findings of this study were submitted as a dissertation to Ensign Global University. The results of this study were compiled into a comprehensive report and shared with the Ho Teaching Hospital.

3.11 Ethical Issues

Ethical clearance was obtained from Ensign Global University. Permission was also obtained from the Ho Teaching Hospital for data collection. Participants were equally informed that participation is voluntary and based on their willingness, they have the power and right to withdraw from the study at any point at all. Anonymity and privacy were assured by giving the participants codes as identification instead of using their names. The purpose of the study was made known to the participants. Participants were also assured that no one would get access to their information. Information provided by participants were kept confidential and will be used for research purposes only.

The time spent by the participants in responding to the questionnaire and some questions which the participant found uncomfortable were some of the risks that were associated with this study. The benefit of this study is that caregivers got to know the nutritional status of their infants since

their children were weighed and assessed using standard growth monitoring tools. This feedback helped caregivers understand whether their child is underweight, of normal weight, or overweight, and may encourage improved feeding practices.

Participants were given assurance that under no circumstance will their identity, particularly names be linked to the data analysis, reporting, and dissemination of the findings of the study. Participants were assured that data storage, analysis, reporting and dissemination of all data will be done in formats that will not expose their identity. Codes were assigned to the participants instead of their names and data analysis was collective. This study ensured that individual participants remain unknown, and any information provided by the participants was kept strictly confidential.

The participants did not receive any form of compensation for their participation in the study but they were duly appreciated by verbally thanking them. The data was made accessible to only the principal investigator and the project supervisor. Also, the data was stored in a password-encrypted space. Participants were informed that participating in this study is voluntary and therefore, they have the right to participate or refuse to participate in the study.

3.12 Limitations of the Study

This study had some limitations. First, the timing of introduction of complementary foods was based on caregivers' recall and may therefore have been affected by recall bias or social desirability bias. Second, the study was conducted among caregivers attending the Child Welfare Clinic at Ho Teaching Hospital, and the findings may not fully represent caregivers who do not attend health facilities or those living in other parts of the Ho Municipality. Third, the cross-sectional design measured exposure and outcome at the same point in time and therefore cannot establish a causal relationship between the timing of complementary feeding and stunting. The findings should therefore be interpreted as associations rather than effects. Finally, the questionnaire captured

porridge as a broad food category and did not collect information on the specific type or ingredients used, limiting detailed assessment of its nutritional quality.

3.13 Assumptions

This study was based on the following assumptions:

1. Caregivers provided accurate and truthful information regarding the timing of introduction of complementary foods and infant feeding practices.
2. Caregivers were able to accurately recall the age at which complementary foods were introduced to their infants.
3. Anthropometric measurements obtained from the Child Welfare Clinic records or measured during the study accurately reflected the nutritional status of the infants.
4. The study participants were representative of caregivers attending the Child Welfare Clinic at Ho Teaching Hospital during the study period.
5. The standardized procedures used for data collection and anthropometric measurements minimized measurement errors and ensured the reliability of the data collected.
6. Other factors that influence stunting, such as recurrent infections, birth weight, and household socioeconomic conditions, were either evenly distributed within the study population or adequately controlled for during the analysis.

CHAPTER FOUR

4.0 RESULTS

4.1 Sociodemographic Characteristics of Respondents

The study included a total of 328 respondents. The age distribution shows that the majority of caregivers were between 25–34 years (39.63%), followed by those aged 35–44 years (32.93%), while 27.44% were between 18–24 years. This indicates that most respondents were within the prime reproductive and caregiving age group. With respect to relationship to the child, the overwhelming majority of respondents were mothers (85.06%), with a smaller proportion being fathers (9.15%), grandparents (4.88%), and others (0.91%). This suggests that infant care and feeding responsibilities are predominantly undertaken by mothers.

In terms of educational attainment, respondents were fairly distributed across levels, with the highest proportions having Junior High School education (25.91%) and Senior High School education (25.30%). About 19.82% had primary education, 19.51% had tertiary education, while 9.45% had no formal education. This reflects a moderately educated population, though a notable proportion still had low or no formal education. Regarding marital status, more than half of the respondents were married (56.10%), followed by those cohabiting (25.91%). Smaller proportions were single (8.84%), widowed (4.88%), and divorced (4.27%), indicating that most respondents were in stable unions. The majority of respondents were employed (76.22%), while 23.78% were not working, suggesting relatively high economic engagement among caregivers.

In terms of religion, most respondents identified as Christians (85.67%), followed by Muslims (8.84%), traditionalists (3.66%), and others (1.83%), reflecting the dominant religious composition of the study area.

Finally, regarding monthly income, the largest proportion of respondents earned between GHC 1000–3000 (35.98%), followed by GHC 3001–5000 (27.74%) and those earning less than GHC 1000 (25.91%). Only 10.37% earned above GHC 5000, indicating that the majority of respondents fall within the low- to middle-income category.

The results also show that the largest proportion of infants were aged 18–24 months (41.46%), followed by 12–17 months (29.88%) and 6–11 months (28.66%), indicating that most infants were in the later stages of infancy. In terms of sex distribution, slightly more than half of the infants were male (51.83%), while 48.17% were female, suggesting a relatively balanced distribution. Regarding prematurity, the majority of infants (87.50%) were born at term, while 9.15% were reported to be born prematurely. A small proportion (3.35%) of caregivers were unsure of the infant's prematurity status.

Table 4.1 Sociodemographic Characteristics of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–24	90	27.44
	25–34	130	39.63
	35–44	108	32.93
Relationship to Child	Mother	279	85.06
	Father	30	9.15
	Grandparent	16	4.88
	Others	3	0.91
Educational Level	No formal education	31	9.45
	Primary	65	19.82
	JHS	85	25.91
	SHS	83	25.30
	Tertiary	64	19.51

Marital Status	Married	184	56.10
	Cohabiting	85	25.91
	Single	29	8.84
	Widow	16	4.88
	Divorced	14	4.27
Employment Status	Working	250	76.22
	Not working	78	23.78
Religion	Christianity	281	85.67
	Islam	29	8.84
	Traditional	12	3.66
	Others	6	1.83
Monthly Income (GHC)	<1000	85	25.91
	1000–3000	118	35.98
	3001–5000	91	27.74
	>5000	34	10.37
Age of infant (months)	6–11	94	28.66
	12–17	98	29.88
	18–24	136	41.46
Sex of infant	Male	170	51.83
	Female	158	48.17
Prematurity status	No	287	87.50
	Yes	30	9.15
	Don't know	11	3.35

4.2 Timing of Introduction of Complementary Feeding among Infants

The figure shows the distribution of the timing of introduction of complementary feeding among infants. More than half of the caregivers (**54.27%**) introduced complementary foods at the recommended time of six months (timely initiation). However, a considerable proportion of

caregivers practiced inappropriate timing, with **24.09%** introducing complementary foods early (before six months) and **21.65%** introducing them late (after six months).

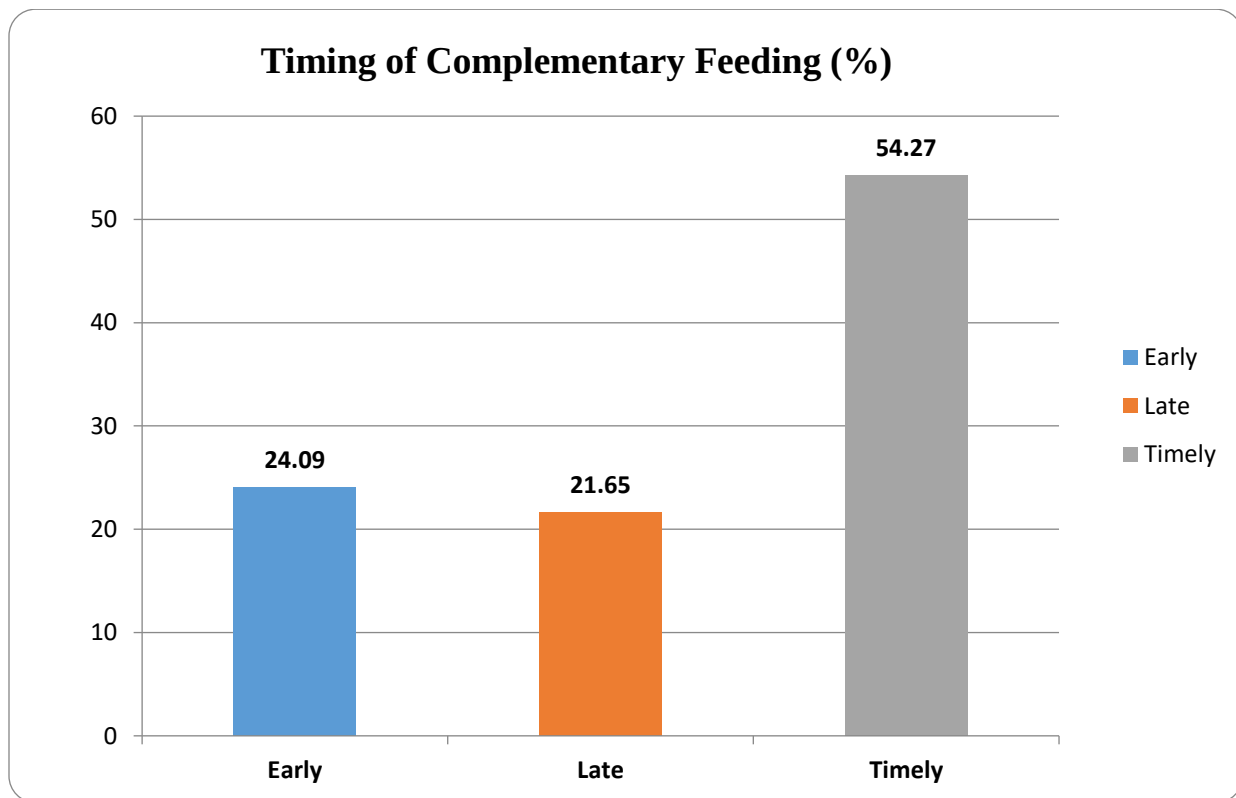


Figure 4.3: *Timing of Complementary Feeding*

4.3 Infant Feeding Practices among Respondents

The findings indicate that breastfeeding is widely practiced among respondents, with 96.04% of caregivers reporting that their infants were ever breastfed. However, adherence to recommended exclusive breastfeeding duration was suboptimal.

Continued breastfeeding after the introduction of complementary feeding was common, with 80.79% of caregivers maintaining breastfeeding alongside complementary foods. Regarding complementary feeding practices, porridge was the most commonly introduced food (51.83%), followed by rice or yam (17.99%) and Cerelac (13.41%), while foods such as soup (2.44%) and other items (4.88%) were less frequently introduced.

Regarding perceived adequacy, a majority of caregivers (59.45%) believed the foods they provided were nutritionally adequate, while 21.95% were uncertain and 18.60% considered them inadequate. Finally, health workers were the main source of feeding information (52.25%), followed by family and friends (23.88%), with smaller proportions relying on social media (12.46%) and traditional media such as TV or radio (11.42%).

Table 4.2 Infant Feeding Practices among Respondents

Variable	Category	Frequency (n)	Percentage (%)
Ever breastfed	Yes	315	96.04
	No	13	3.96
Exclusive breastfeeding duration	Less than 1 month	43	13.11
	1–3 months	56	17.07
	4–5 months	102	31.10
	Exactly 6 months	99	30.18
	More than 6 months	28	8.54
Continued breastfeeding after CF	Yes	265	80.79
	No	63	19.21
Type of complementary food introduced	Porridge	170	51.83
	Rice or yam	59	17.99
	Cerelac	44	13.41
	Mashed fruits/vegetables	31	9.45
	Others	16	4.88
	Soup	8	2.44
Perceived adequacy of feeding	Yes	195	59.45
	Uncertain	72	21.95
	No	61	18.60
Source of feeding information	Health worker	151	52.25
	Family/friends	69	23.88
	Social media	36	12.46
	TV/radio	33	11.42

4.4 Proportion of Infants Experiencing Stunting In Ho Teaching Hospital, Ghana

The results show that the majority of infants were not stunted (81.71%), while 18.29% were classified as stunted.

Table 4.3 Proportion of Infants Experiencing Stunting In Ho Teaching Hospital, Ghana.

Stunting Status	Frequency (n)	Percentage (%)
Not stunted	268	81.71
Stunted	60	18.29
Total	328	100.00

4.5 Association between Timing of Complementary Feeding and Stunting

The results show that the prevalence of stunting varied across the different timing categories of complementary feeding. Infants who were introduced to complementary feeding early had a stunting prevalence of 26.09%, compared to 32.14% among those introduced late, while those introduced at the recommended time had the lowest prevalence of stunting (5.92%).

However, the observed differences were not statistically significant ($\chi^2 = 1.33$, $p = 0.515$). This indicates that there is no significant association between the timing of complementary feeding and stunting among infants in this study.

Table 4.4 Association between Timing of Complementary Feeding and Stunting

Variable	Not Stunted n (%)	Stunted n (%)	Chi-square (χ^2)	P-value
Timing of CF			1.33	0.515
Early	68 (73.91)	24 (26.09)		
Late	57 (67.86)	27 (32.14)		
Timely	143 (94.08)	9 (5.92)		

4.6 Logistic Regression Analysis of Factors Associated with Stunting

The multivariable logistic regression analysis showed that the timing of complementary feeding was not significantly associated with stunting after adjusting for socio-demographic factors. However, caregiver education and employment status were significant predictors. Caregivers with no formal education (AOR = 2.90, 95% CI: 1.02–8.22; $p = 0.046$) and those with tertiary education (AOR = 2.94, 95% CI: 1.22–7.08; $p = 0.016$) had higher odds of having stunted children compared to those with JHS education after adjusting for all other covariates. In contrast, caregivers who were working had lower odds of having stunted children (AOR = 0.46, 95% CI: 0.24–0.88; $p = 0.019$). Other variables, including income, infant age, and sex, were not significantly associated with stunting.

Table 4.5 Logistic Regression Analysis of the Association between Timing of Complementary Feeding and Stunting

Variable	Category	AOR (95% CI)	p-value
Timing of CF	Early (Ref)	–	–
	Late	1.36 (0.56–3.35)	0.495
	Timely	1.39 (0.64–3.01)	0.402
Education	JHS (Ref)	–	–
	No formal education	2.90 (1.02–8.22)	0.046
	Primary	1.07 (0.40–2.88)	0.896
	SHS	1.21 (0.49–3.02)	0.678
	Tertiary	2.94 (1.22–7.08)	0.016
Employment	Not working (Ref)	–	–
	Working	0.46 (0.24–0.88)	0.019
Monthly Income (GHC)	1000–3000 (Ref)	–	–
	3001–5000	0.76 (0.36–1.64)	0.492

	<1000	0.84 (0.40–1.74)	0.631
	>5000	1.06 (0.37–3.00)	0.916
Infant Age (months)	6–11 (Ref)	–	–
	12–17	0.61 (0.28–1.33)	0.213
	18–24	0.75 (0.38–1.51)	0.424
Infant Sex	Female (Ref)	–	–
	Male	0.93 (0.51–1.68)	0.803

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the main findings of the study on the timing of introduction of complementary feeding and its effects on infant nutritional status in the Ho Municipality. It goes beyond presenting the results by explaining the patterns observed and comparing them with findings from other studies. The discussion also considers possible reasons for the findings and places them within the broader context of infant and young child feeding practices.

5.2 Timing of Introduction of Complementary Feeding among Infants

The present study found that slightly more than half of caregivers (54.27%) introduced complementary foods at the recommended age of six months, while a substantial proportion practiced inappropriate timing, with 24.09% initiating early and 21.65% initiating late. This pattern reflects a mixed adherence to recommended infant and young child feeding (IYCF) guidelines, where correct knowledge and practice coexist with persistent deviations.

Within the study's conceptual framework, these findings align with the institutional level, where access to health information and counselling services at Child Welfare Clinics positively influences caregiver behaviour. However, the persistence of both early and late initiation of complementary feeding suggests that knowledge alone does not necessarily translate into appropriate practice. Early introduction of complementary foods may be driven by perceived breast milk insufficiency, maternal return to work, and pressure from family members, particularly grandmothers, who often influence infant feeding decisions (Issaka et al., 2021; Saaka et al., 2022). Similarly, cultural beliefs and social norms have been shown to encourage early feeding despite awareness of recommended guidelines (Arhin, 2019).

On the other hand, delayed initiation of complementary feeding may reflect misinterpretation of exclusive breastfeeding messages or uncertainty about infant readiness for solid foods (Yeboah et al., 2021). This is consistent with evidence that some caregivers continue exclusive breastfeeding beyond six months due to the perception that breast milk remains sufficient (WHO, 2023). These dynamics operate at the interpersonal and household levels of the conceptual framework, where family influence, cultural expectations, and socio-economic constraints interact with individual knowledge to shape feeding decisions (UNICEF, 2023).

The findings of this study are consistent with evidence from sub-Saharan Africa. For instance, Mekonnen et al. (2024) reported that although a proportion of mothers initiate complementary feeding at six months, a considerable number still introduce foods either too early or too late, reflecting persistent gaps in optimal feeding practices across the region. Similarly, Issaka et al. (2021) found that timely initiation remains suboptimal and is strongly influenced by maternal education, household wealth, and access to health services.

However, the level of timely initiation observed in this study appears slightly higher than that reported in some settings. For example, Niyigena et al. (2023) documented lower levels of timely complementary feeding, with a greater proportion of caregivers introducing foods either prematurely or too late. This difference may be attributed to variations in health service coverage, effectiveness of nutrition counselling, and local socio-cultural norms. In contrast, evidence synthesized by Padhani et al. (2023) indicates that even in contexts where awareness of the six-month recommendation is relatively high, actual practices often diverge due to competing household and social pressures. This supports the observation that knowledge of guidelines does not necessarily guarantee adherence.

These findings highlight that while progress has been made in promoting timely complementary feeding, inappropriate timing is still a significant concern. Informal interactions with some caregivers during data collection provided further insight into the reasons for early introduction of complementary feeding. One caregiver reported that she introduced porridge at four months because she believed her breast milk alone was not sufficient to satisfy the infant, especially when the child cried frequently. Another caregiver indicated that she resumed work shortly after delivery, which made exclusive breastfeeding difficult and necessitated the early introduction of complementary foods. It suggests that interventions should move beyond information provision to address context-specific barriers, including caregiver beliefs, economic constraints, and the practical challenges of implementing recommended feeding practices.

5.3 Infant Feeding Practices among Respondents

The findings of this study indicate that breastfeeding is nearly universal among caregivers, with 96.04% reporting that their infants were ever breastfed. This high prevalence may be attributed to strong national and global promotion of breastfeeding through maternal and child health services, particularly at child welfare clinics. Within the study's conceptual framework, this reflects the influence of health system factors and policy-level interventions, where consistent health education and antenatal/postnatal counselling encourage breastfeeding as a normative practice. Similar high breastfeeding rates have been reported in sub-Saharan Africa. For instance, Christian et al. (2023) found that breastfeeding initiation is almost universal across many African settings, largely due to widespread public health campaigns. Likewise, Issaka et al. (2021) observed high breastfeeding uptake in SSA, attributing it to improved maternal awareness and routine health service contact. However, while breastfeeding initiation is high, the challenge often lies in adherence to recommended practices.

The continuation of breastfeeding alongside complementary feeding (80.79%) is encouraging and aligns with recommended IYCF practices. This may reflect sustained engagement with health services and caregiver awareness of the benefits of continued breastfeeding. Studies such as Jones et al. (2020) highlight that continued breastfeeding is commonly practiced even in settings where exclusive breastfeeding is suboptimal, indicating partial adherence to guidelines. This pattern suggests that while caregivers may struggle with the timing of introducing other foods, they still recognize the importance of maintaining breastfeeding, reinforcing the role of health education at the institutional level.

With regard to complementary foods, the dominance of porridge (51.83%) as the first food introduced reflects a strong reliance on cereal-based diets, which are widely available, affordable, and culturally accepted. However, such foods are often low in essential nutrients when not adequately fortified. This finding can be explained by household economic constraints and food availability, key components of the household level within the conceptual framework. Similar patterns have been documented in the literature. Ogunniran et al. (2024) noted that complementary feeding in sub-Saharan Africa is predominantly based on cereal gruels with low nutrient density. Likewise, UNICEF (2020) reports that many infants in low- and middle-income countries consume monotonous diets lacking dietary diversity. In Ghana, Issaka et al. (2021) also identified cereal-based porridges as the most common complementary foods, often prepared with high water content and minimal protein enrichment.

The perception among caregivers that the foods provided were nutritionally adequate (59.45%) reflects the individual level of the conceptual framework, where caregiver knowledge and understanding influence feeding decisions. For example, Jones et al. (2020) found that caregivers often overestimate the nutritional value of commonly used foods, particularly cereal-based diets.

Finally, the finding that health workers were the primary source of feeding information (52.25%) underscores the critical role of the health system in shaping infant feeding practices. This aligns with findings from Mekonnen et al. (2024), who reported that contact with health services significantly improves feeding knowledge and practices. However, the continued influence of family and friends (23.88%) indicates that informal social networks remain powerful determinants of behaviour, sometimes reinforcing practices that contradict recommended guidelines. This dual influence highlights the importance of integrating community-based approaches with facility-based counselling to ensure consistent messaging.

Generally, these findings demonstrate that while breastfeeding practices are widely adopted, gaps remain in exclusive breastfeeding and the quality of complementary feeding. The interplay between health system support, household constraints, and socio-cultural influences, as outlined in the conceptual framework, is critical in shaping these practices.

5.4 Proportion of Infants Experiencing Stunting

The findings of this study showed that 18.29% of infants were stunted, while the majority (81.71%) were not stunted. This prevalence is slightly higher than the national estimate reported in the Ghana Demographic and Health Survey (GDHS 2022/23), which indicates that approximately 17% of children under five years in Ghana are stunted (Ghana Statistical Service [GSS], Ghana Health Service [GHS], & ICF, 2023). This indicates a moderate level of chronic undernutrition among infants in the study area. The prevalence observed in this study is broadly consistent with national trends in Ghana. For instance, the Ghana Statistical Service (GSS), Ghana Health Service (GHS) and (ICF, 2023) reports that stunting among children under five is a public health concern, although there has been a gradual decline over the years. Similarly, UNICEF (2023) reports that while global stunting rates have declined, a substantial proportion of children in low- and middle-income

countries continue to experience growth faltering, particularly during the complementary feeding period.

Comparable findings have also been reported in other sub-Saharan African settings. For example, Christian et al. (2023) found notable levels of stunting among children in SSA, highlighting that inadequate feeding practices and socio-economic constraints continue to affect child growth. Likewise, Mekonnen et al. (2024) reported that undernutrition, including stunting, remains prevalent across many SSA countries despite improvements in infant feeding practices. These similarities indicate that the burden of stunting observed in this study is not unique but reflects a broader regional challenge.

However, the prevalence in this study appears lower than that reported in some other settings. Evidence from the “Stories of Change” literature emphasizes that variations in child nutritional outcomes across countries are driven by multiple interacting factors rather than a single determinant. For instance, Nisbett et al. (2022) highlight that improvements in child nutrition are typically associated with broader changes in health systems, maternal education, and socio-economic conditions, alongside nutrition-specific interventions.

Similarly, the Ghana-focused study by Aryeetey et al. (2021) found that reductions in stunting were linked to improvements in access to health services, maternal and child care practices, and wider socio-economic development over time. These findings suggest that differences in stunting prevalence across settings reflect variations in the broader enabling environment, rather than differences in complementary feeding practices alone.

Despite the relatively lower prevalence, the presence of stunting among nearly one in five infants is a concern. Factors such as inadequate dietary diversity, recurrent infections, poor sanitation, and household poverty may contribute to growth faltering. As highlighted by Krasevec et al. (2017)

and UNICEF (2020), poor diet quality and limited access to nutrient-rich foods are key drivers of stunting in many low-resource settings. Within the conceptual framework, these factors operate at the household and environmental levels, interacting with individual feeding behaviours to influence child nutritional status.

While the majority of infants in this study were not stunted, the observed prevalence indicates that chronic undernutrition is a public health issue in the Ho Municipality. The findings underscore the need for continued efforts to improve not only the timing of complementary feeding but also the quality of infant diets and the broader socio-economic conditions that support optimal child growth.

5.5 Association between Timing of Complementary Feeding and Stunting

The findings of this study showed that although stunting varied across the different timing categories of complementary feeding, these differences were not statistically significant. Infants who were introduced to complementary feeding at the recommended time had the lowest prevalence of stunting, while those introduced early and late had relatively higher proportions. However, both the chi-square test and multivariable logistic regression analysis indicated that timing of complementary feeding was not a significant predictor of stunting. This suggests that, within this study population, the timing of introduction alone may not be sufficient to explain variations in child growth outcomes.

The multivariable analysis further revealed that caregiver education and employment status were significant predictors of stunting. Caregivers with no formal education (AOR = 2.90, 95% CI: 1.02–8.22; $p = 0.046$) and those with tertiary education (AOR = 2.94, 95% CI: 1.22–7.08; $p = 0.016$) had higher odds of having stunted children compared to those with JHS education. In contrast, caregivers who were working had lower odds of having stunted children (AOR = 0.46,

95% CI: 0.24–0.88; $p = 0.019$). Other variables, including income, infant age, and sex, were not significantly associated with stunting. These findings highlight the importance of socio-demographic factors in shaping child nutritional outcomes.

A plausible explanation for the lack of association between timing of complementary feeding and stunting is that stunting is a multifactorial condition influenced by an interaction of dietary, health, and socio-economic factors. While the timing of complementary feeding is important, it does not necessarily translate into improved growth outcomes when the quality and diversity of complementary foods are inadequate. In this study, the predominance of cereal-based foods such as porridge may have limited the nutritional benefits of timely feeding. This aligns with evidence that poor diet quality, rather than timing alone, is a major driver of stunting in low- and middle-income countries (UNICEF, 2020; Krasevec et al., 2017).

The findings of this study are consistent with several empirical studies that have reported no significant association between timing of complementary feeding and stunting. For instance, Niyigena et al. (2023) found that although inappropriate feeding practices were prevalent, the timing of complementary feeding was not significantly associated with stunting among children in Rwanda. Similarly, Jones et al. (2020) reported that the relationship between infant feeding practices and linear growth outcomes is often weak or inconsistent. In addition, Padhani et al. (2023) concluded that the timing of complementary feeding does not consistently influence growth outcomes, particularly when other factors such as diet quality are not considered.

However, the findings contrast with other studies that have demonstrated a significant association between complementary feeding practices and stunting. For example, Christian et al. (2023) reported that suboptimal infant and young child feeding practices were associated with increased odds of stunting in sub-Saharan Africa. Likewise, Masuke et al. (2021) found that inappropriate

complementary feeding practices significantly predicted poor nutritional status among children in Tanzania. These differences may be attributed to contextual variations, particularly in dietary quality, socio-economic conditions, and health system effectiveness.

From the perspective of the conceptual framework, these findings highlight that infant nutritional status is shaped by multiple interacting determinants across different levels. While timing of complementary feeding represents an individual-level behavioural factor, its effect is mediated by interpersonal influences (such as family advice), household conditions (such as food security), and institutional factors (such as access to health services). The significance of caregiver education and employment observed in this study further reinforces the role of socio-economic and structural determinants in influencing child nutrition outcomes.

The findings suggest that although timely complementary feeding is important, it is not sufficient on its own to prevent stunting. Greater emphasis should therefore be placed on improving the nutritional quality, diversity, and adequacy of complementary foods, alongside strengthening caregiver education and addressing broader socio-economic determinants.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study assessed the timing of introduction of complementary feeding and its effects on infant nutritional status among caregivers attending the Child Welfare Clinic at Ho Teaching Hospital in the Volta Region of Ghana. The findings revealed that although more than half of caregivers (54.27%) introduced complementary foods at the recommended age of six months, a substantial proportion still practiced inappropriate timing, with nearly one-quarter introducing foods early (24.09%) and over one-fifth introducing them late (21.65%).

Breastfeeding practices were generally high, with almost all infants having been breastfed. However, adherence to exclusive breastfeeding for the first six months was suboptimal, as the majority of caregivers introduced other foods before the recommended age. Complementary feeding practices were largely dominated by cereal-based foods, particularly porridge. The prevalence of stunting among infants in this study was 18.29%. Importantly, the study found no statistically significant association between the timing of complementary feeding and stunting. Although infants introduced to complementary feeding at the recommended time had lower prevalence of stunting, this relationship was not significant after statistical analysis.

The study concludes that while progress has been made in promoting appropriate feeding practices, gaps remain in both the timing and quality of complementary feeding. Addressing infant malnutrition therefore requires a more comprehensive approach that goes beyond timing to include improvements in dietary diversity, caregiver knowledge, and supportive household and community environments.

6.2 Recommendations

1. Health facilities, particularly Child Welfare Clinics, should intensify education on the correct timing of complementary feeding, emphasizing not only the “six-month rule” but also practical guidance on how to implement it. [⚠ FLAG – Philip Baba Adongo: Do your results show that this was not done and that it led to poor timing? If not, this recommendation should be grounded in a finding from the study.]
2. The Ghana Health Service (GHS), Ho Teaching Hospital, and Community Health Nurses (CHNs) should intensify caregiver education on dietary diversity by promoting the inclusion of protein-rich foods such as legumes, fish powder, eggs, and fortified foods in infants’ diets.
3. The Ghana Health Service (GHS), Child Welfare Clinic staff, and Nutrition Officers should strengthen nutrition counselling at Child Welfare Clinics by emphasizing appropriate complementary feeding practices, including meal frequency, food consistency, and safe food preparation.
4. The Ghana Health Service (GHS), through CHPS and Community Health Nurses (CHNs), should strengthen routine growth monitoring at Child Welfare Clinics and reinforce it with regular home visits to ensure early detection and management of growth faltering. [⚠ FLAG – Philip Baba Adongo: Please ensure recommendations 3 and 4 are directly grounded in the findings of this study. If these issues were not identified as barriers or gaps in your results, revise or remove these recommendations.]

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APPENDICES

APPENDIX I: PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

Title of Study:

Timing of Introduction of Complementary Foods and Its Effects on Infant Nutritional Status in the Ho Teaching Hospital, Ho Municipality, Volta Region, Ghana

Principal Investigator:

Annette Semenyó Nutsukpo

Ensign Global University

Tel: +233 20 368 6589

Email: annette.nutsukpo@st.ensign.edu.gh

You are being invited to take part in this research study. Before you decide, please read the information below carefully. You may ask any question if something is not clear.

Purpose of the Study

The purpose of this study is to assess how the timing of introducing complementary foods (early, timely, or late) affects the nutritional status of infants aged 6–24 months attending the Child Welfare Clinic (CWC) at Ho Teaching Hospital.

Procedures

If you agree to participate:

- You will respond to a questionnaire about your infant's feeding practices and your knowledge on complementary feeding.
- Your child will be weighed to assess his/her nutritional status.
- The interview will take about **15–20 minutes** and will be conducted in a private space at the hospital in **Ewe or English**, depending on your preference.

Risks and Discomforts

There are **no major risks** involved in this study. Some questions may make you feel slightly uncomfortable, but you may choose not to answer any question you do not wish to.

Benefits

There is no direct payment or material benefit for joining this study. However:

- You will receive feedback about your child's nutritional status.
- The results may help improve child nutrition programmes and health education in Ghana.

Confidentiality

All the information you provide will be kept **private and confidential**. Your name will **not** be written on the questionnaire. Instead, a code number will be used. Only the research team will have access to the data.

Voluntary Participation and Right to Withdraw

Participation in this study is **voluntary**. You may choose **not to take part** or **withdraw at any time** without giving a reason. Your decision will not affect the care or services you receive at this hospital.

Contact Information

If you have any questions about this study, please contact:

Principal Investigator:

Name: Annette Semenyó Nutsukpo

Tel: +233 20 368 6589

Email: annette.nutsukpo@st.ensign.edu.gh

Consent Statement

Please tick (✓) to show your understanding:

Statement	Agree
I have read or have had this information explained to me.	☐
I understand the purpose, procedures, risks, and benefits of this study.	☐
I know that taking part is voluntary and I can withdraw at any time.	☐
I agree that my child will be weighed for nutritional assessment.	☐
I give permission for my information to be used for research only.	☐
I agree to participate in this study.	☐

Participant Information

Full Name (optional): _____

Signature/Thumbprint: _____ Date: ____ / ____ / 2025

Contact (optional): _____

Statement by Researcher

I have explained the study to the participant in a language they understand. I have answered all their questions.

Name of Researcher: _____

Signature: _____ Date: ____ / ____ / 2025

Witness (If participant cannot read or write)

Name: _____

Signature/Thumbprint: _____ Date: ____ / ____ / 2025

Relationship to participant: _____

APPENDIX II: Questionnaire

s/n	QUESTIONS	RESPONSES
	SECTION A: Sociodemographic Factors	
01	What is your age at last birthday?	-----
02	What is your relationship to the child?	1. Mother [] 2. Father [] 3. Grandparent [] 4. Others []
03	What is your highest level of education?	1. No formal education [] 2. Primary [] 3. JHS [] 4. SHS [] 5. Tertiary []
04	What is your current marital status?	1. Single [] 2. Cohabiting [] 3. Married [] 4. Divorced [] 5. Widow []
05	What is your current employment status	1. Not working [] 2. Working []
06	What is your religion?	1. Christianity [] 2. Islam [] 3. Traditional [] 4. Others []
07	What is your household monthly income (GHC)	1. <1000 [] 2. 1000-3000 [] 3. 3001-5000 [] 4. >5000 []
	SECTION B: Infant information	
08	What is the sex of the infant?	1. Male [] 2. Female []
09	What is the age of infant (in months)?	-----
10	Was the infant born prematurely (Before 37 weeks)?	0. No [] 1. Yes [] 2. Don't know []
	SECTION C: Feeding practices	
11	Was the infant ever breastfed?	0. No [] 1. Yes []

12	If yes, how long was the infant exclusively breastfed (only breast milk, no other food or liquids)?	1. Less than 1 month [] 2. 1–3 months [] 3. 4–5 months [] 4. Exactly 6 months [] 5. More than 6 months []
13	At what age (in months) was complementary food first introduced to the infant?	-----
14	How would you categorize the timing of complementary feeding?	1. Early (before 6 months) [] 2. Timely (at 6 months) [] 3. Late (after 6 months) []
15	Was breastfeeding continued after introducing complementary food?	0. No [] 1. Yes []
16	What types of complementary foods were first introduced?	1. Porridge (e.g., koko, tom brown) [] 2. Mashed fruits/vegetables [] 3. Cerelac or other commercial baby foods [] 4. Rice or yam [] 5. Soup [] 6. Others []
17	Do you consider the food you provide nutritionally adequate and age-appropriate?	1. Yes [] 2. No [] 3. Uncertain []
18	Do you receive feeding advice or education from any of the following sources?	1. Health worker [] 2. Family/friends [] 3. TV/radio [] 4. Social media [] 5. None []
	SECTION D: Infant's nutritional status	
19	What is the infant's weight (measured)?	----- kg
20	What is the infant's age (confirmed)?	----- months
	SECTION E: Maternal knowledge on complementary feeding	
21	At what age (months) should a baby start eating other foods in addition to breast milk?	1. 4 months [] 2. 5 months [] 3. 6 months [] 4. 7 months []
22	Do you know what appropriate complementary feeding involves?	0. No [] 1. Yes []

23	In your opinion, what are the effects of early or late introduction of complementary feeding on the child's health?	1. The child may become underweight [] 2. The child may become overweight [] 3. The child may get sick often [] 4. The child may not grow well [] 5. No effect at all [] 6. I don't know [] 7. Others []
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APPENDIX III: PERMISSION LETTER FROM

In case of reply the number
And the date of this
Letter should be quoted
My Ref. No. HTH/RPPME/
Your Ref. No....

Our Core Values:

- ✍ Commitment
- ✍ Accountability
- ✍ Dedication
- ✍ Integrity
- ✍ Professionalism
- ✍ Innovation
- ✍ Teamwork
- ✍ Safe Care



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24th November, 2025

Annette Semenyio Nutsukpo
Ministry of Health
Accra

RE: PERMISSION TO USE HO TEACHING HOSPITAL AS A STUDY AREA

In reference to your permission to conduct a research study titled, "*Timing of Introduction of Complementary Foods and Its Effect on Infant Nutritional Status*," we are pleased to inform you that the Management of Ho Teaching Hospital has granted approval for the study to be conducted within the facility.

This approval is granted subject to the following ethical and administrative requirements being fully satisfied:

- 1. Obtain ethical clearance from a recognized Institutional Review Board and submit a copy to the Research Department prior to the commencement of the study.**
- 2. Complete the Ho Teaching Hospital Research Coordination Form before initiating data collection.**
- 3. Provide proof of payment for data collection and facility user fees, where applicable.**
- 4. Submit a copy of the final research report to the Research Department upon completion of the study.**

The Hospital acknowledges the importance of this study and expresses the hope that its findings will contribute meaningfully to improving infant nutrition, guiding complementary feeding practices, and supporting maternal and child health interventions within the facility and the wider community.

Thank you

For: 
[Simon Dzokoto]
Director, RPPME

APPENDIX IV: ETHICAL CLEARANCE FROM ENSIGN GLOBAL UNIVERSITY



OUR REF: ENSIGN/IRB/EL/SN-332/02
YOUR REF:

December 4, 2025.

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Annette Nutsukpo Semenyo
Ensign Global University
Kpong.

Dear Annette,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global University held on Wednesday, December 3, 2025, your research proposal entitled “**Timing of Introduction of Complementary Foods and its Effects on Infant Nutritional Status in the Ho Teaching Hospital in the Ho Municipality, Volta Region, 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,

A handwritten signature in black ink, appearing to read "Rebecca Acquah-Arhin", with a stylized flourish at the end.

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