GESTATIONAL WEIGHT GAIN AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE IN PUBLIC AND PRIVATE HEALTH FACILITIES IN GAROWE, PUNTLAND, SOMALIA

MPH THESIS

HAFSO FARAH MIRE (BSC)

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HARAMAYA UNIVERSITY, HARAR, ETHIOPIA

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A thesis submitted to the School of Public Health,
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In partial fulfillment of the Requirement for the Degree of

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HAFSO FARAH MIRE

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APPROVAL SHEET

HARAMAYA UNIVERSITY POST GRADUATE PROGRAMS DIRECTORATE

I hereby certify that I have read and evaluated this Thesis entitled " Gestational Weight gain and Associated Factor Among Pregnant women Attending Antenatal care in Public and Private Health facilities in Garowe Puntland, Somalia " prepared under my guidance by Hafsa Farah Mire. I recommend that it be submitted as fulfilling the thesis requirement.

Mr. Berhe Gebremichael (MPH, Assistant Professor) _____ _____

Major Advisor Signature Date

Dr. Tesfaye Assebe (PhD. Associate Professor) _____ _____

Co- Advisor Signature Date

As a member of the Board of Examiners of the MPH Thesis Open Defense Examination, I certify that I have read and Evaluated the Thesis prepared by Hafsa Farah Mire and examined the candidate, I recommend that the thesis be accepted as fulfilling the Thesis requirement for the degree of Master of Public Health in Nutrition.

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STATEMENT OF THE AUTHOR

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Name: Hafsa Farah Mire _____

School/department: public health

BIOGRAPHICAL SKETCH

The author was born and raised in Gardo Puntland , Somalia in 1998. she attended for her primary and secondary school in Imam-Nawawi school in Gardo Puntland ,Somalia. After completion of high school, she was she was joined university of Health Science in Bosaso Puntland ,Somalia 2018 and graduated in food science and nutrition in 2021.

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TABLE OF CONTETENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION AND ACRONYMS

ANC: ANTENATAL CARE

AOR: Adjusted Odd Ratio

BMI: Body Mass Index

CI: Confidence Interval

DM: Diabetes Mellitus

GA: Gestational Age

SD: Standard Deviation

IHRERC: Institutional Health Research &Ethical Review Committe

IOM: United States Institute of Medicine

KG: Kilogram

LBW: Low Birth Weight

MCH: Maternal And Child Health

OR: Odd Ratio

SGA: Small gestational age

GA: Gestational age

GDM: Gestational Diabetes Mellitus

GWG: Gestational Weight Gain

HTN: Hypertension

ABSTRACT

Background: The weight gained during pregnancy is known as gestational weight gain, which is a normal physiological process that support the increased metabolic demands of pregnancy as well as fetal growth and development. However inappropriate GWG is significant public health concerns, as it has been linked to adverse pregnancy outcome and increases the risk of future obesity and chronic disease in women. Evidence regarding gestational weight gain is scarce in Somalia, particularly in the Garowe City.

Objectives: To assess the level of gestational weight gain and associated factors among pregnant women attending antenatal care in public and private health facilities in Garowe City, Puntland, Somalia, from July 15 to August 15 2024.

Methods: An institution- based cross-sectional study was conducted on 412 systematically selected pregnant women in selected public and private health facilities in Garowe district of Puntland, Somalia. Data were firstly entered into kobo Toolbox, cleaned in Excel, and then exported to Stata version 17 for analysis. Data was collected using pretested and structured questionnaire. Descriptive statistical analysis, including simple frequencies, percentages, mean and standard deviation were used to describe participants' characteristics .Information was presented using text descriptions, tables and figures. Binary logistic regression was fitted to identify the factors associated with gestational weight Gain. Level of statistical significance was declared at p- value<0.05 in the multivariable analysis, reporting adjusted odds ratio with 95% confidence intervals (CI)

Result: The study showed that the mean gestational weight gain of the women was 8.22 kg (SD=1.73), and 57.35% (95% CI 52.4%, 62.08%) of the women had inadequate gestational weight gain. No formal education (AOR=2.00, 95% CI: 1.02, 3.77), multi gravidity (AOR=5.47, 95% CI: 1.91, 15.58) and lower early pregnancy body mass index (underweight) (AOR=5.32, 95% CI: 3.06, 9.26) were significantly associated with inadequate gestational weight gain.

Conclusions

The finding of the study revealed a higher magnitude of inadequate gestational weight gain. Being underweight at early pregnancy and lack of adequate food was positively associated with inadequate weight gain. These results highlight the importance of addressing pre-pregnancy BMI, ensuring a balanced diet.

Keywords Gestational weight gain, body mass index, small gestational age, antenatal care.

1. INTRODUCTION

1.1 BACKGROUND

Pregnancy-related weight gain, or gestational weight gain (GWG), is a normal physiological process that support the increased metabolic demands of pregnancy as well as fetal growth and development. However inappropriate GWG is significant public health concerns, as it has been linked to adverse pregnancy outcome and increases the risk of future obesity and chronic disease in women. (Adeoye et al., 2023).

Gestational weight gain is mostly caused by a variety of biological, metabolic, and social factors. The mother's body mass index (BMI) prior to becoming pregnant, multiparity, age, smoking, level of education attained, level of physical activity, a nutritious diet, and appropriate counseling regarding weight gain during pregnancy are some of these factors(Asefa and Nemomsa, 2016a). Optimal GWG is necessary for a balanced desired outcome for the mother and her babies. To encourage healthy fetal growth and development and reduce maternal morbidity and death, it is recommended to gain weight during pregnancy based on pre-pregnancy weight. GWG is one of the essential components promoting both a healthy pregnancy outcome and the development and growth of the fetus (Martínez-Hortelano et al., 2020)

A desirable GWG is required in order for the mother and her child to have a balanced, ideal outcome. It not only lowers the risk of morbidity and mortality but also encourages the growth and development of the fetus. On the other hand, gaining excessive or low weight may be detrimental to the health of the mother and/or the fetus. (Asefa et al., 2020)

Nutrition plays a major role in influencing pregnancy outcomes, both prior to and during conception. Healthy eating practices and reducing known risks increase the likelihood of normal, healthy babies being born as well as fewer pregnancy-related complications for expectant mothers. On the other hand, pregnant women who experience malnutrition before or during their pregnancy are more likely to experience unfavorable pregnancy outcomes. Before getting pregnant, a woman's body needs nutrients for growth and maintenance. A nutritious diet keeps her well. During pregnancy, there is an increased requirement for all nutrients in order for the fetus to develop normally inside the uterus. (Mugyia et al., 2016)

Preterm delivery, small for gestational age (SGA), intrauterine growth restriction, and low birth weight (LBW) are among the adverse outcomes that are associated with low GWG. Excessive

GWG is associated with an increased risk of macrosomia, postpartum weight, and gestational diabetes cesarean section. (Ouédraogo et al., 2020)

The 2009 revised IOM guidelines included the World Health Organization's (WHO) categories for maternal body mass index (BMI), which are calculated by dividing weight in kilograms by height in meters squared. The BMI ranges from <18.5 for underweight people to 18.5-24.9 for people of normal weight, 25–29.9 for overweight people, and ≥30 for people who are obese. Pregnant obese women were advised to gain less weight. (Goldstein et al., 2017)

The recommended weight gains, as per IOM guidelines, were 12.5–18, 11.5–16, 7.0–11.5, and 5.0–9.0 kg for underweight, normal-weight, overweight, and obese women, respectively. The weight before delivery (kg) less the weight before pregnancy (kg) is the pregnancy weight gain (kg). EGWG is defined as gestational weight gain that exceeds the IOM guideline's recommended thresholds. (Zhou et al., 2022)

Pregnancy and perinatal outcomes are significantly impacted by the maternal pre-pregnancy body mass index (BMI) and gestational weight gain (GWG). Preeclampsia, diabetes mellitus (DM), stillbirth, and hypertension have all been linked to high maternal body weight (HBW) during pregnancy. Low body weight increases the risk of low birth weight babies and preterm deliveries. (Nowak et al., 2019)

1.2. STATEMENT OF THE PROBLEM:

Pregnancy and delivery management are facing a major challenge due to the increasing global prevalence of overweight and obesity during pregnancy. (Langley-Evans et al., 2022)

Populations differ in the frequency of insufficient GWG. For 32 percent of US women giving birth to full-term infants, the GWG was within the recommended range. The weight gain was less than the US Institute of Medicine's (IOM) recommended amount in 21% of cases and greater in 48% of cases. (Suliga et al., 2018a)

A population-based study conducted in the United States revealed that 32.0% of participants gained weight within recommended limits, while 20.9% gained insufficient weight and 47.2% gained excessive weight. Moreover, underweight women had the highest rate of inadequate weight gain (39.3%), while class I obese and overweight women had the highest rates of excessive weight gain (64.1% and 63.5%, respectively). (Engidaw et al., 2023)

Suboptimal Gestational Weight Gain (GWG) is a significant and widespread obstetric problem, indicating a failure to meet recommended health targets. (Control and Prevention, 2016) Globally, this issue exhibits a high prevalence, though the dominant form (inadequate versus excessive) varies by location and population. In countries like the United States, less than a third (32%) of women delivering full-term infants achieve GWG within the recommended limits set by bodies like the US Institute of Medicine (IOM). (Control and Prevention, 2016) This signifies that suboptimal GWG is the norm for the majority (68%) of pregnant women. Specifically, a large proportion of women in the US (48%) experience excessive GWG, while a significant minority (21%) experience inadequate GWG compared to IOM recommendations.(Control and Prevention, 2016) There are high rates of overweight and obesity among pregnant women worldwide. For example, 40% of pregnant women in England are overweight or obese. In Australia, 13% of pregnant women are overweight, and 20% are obese. (Zhou et al., 2022)

In contrast, inadequate GWG is recognized as a major public health concern and is highly prevalent in low-income Sub-Saharan African countries. The prevalence of inadequate GWG varies considerably across populations, demonstrating that this is a context-specific challenge requiring localized assessment.(Haugen et al., 2014)

Obesity and/or high GWG have been associated with an increased risk of perinatal deaths, cesarean sections, and subsequent obesity in mothers and offspring.(Henriksson et al., 2020)

Sub-optimal gestational weight gain (GWG) is related with different adverse pregnancy

Outcomes. These outcomes may include, but are not confined to high birth weight

(HBW), low birth weight (LBW), pregnancy-induced hypertension, gestational diabetes, Preterm births, caesarean delivery, and delayed initiation of breastfeeding (Haugen et al., 2014). Unsuitable GWG can pose health risks for mother and baby. Women who do not gain Inadequate or enough weight gain during pregnancy are at risk of having a baby with low Birth weight (LBW) preterm birth (Huang et al., 2016). Health risks related to inadequate weight Gain during pregnancy include a greater risk of premature birth and a low birth weight Baby and/or intrauterine hypotrophy and finally an increased risk of morbidity and Mortality (Goldstein et al., 2017).

Low birthweight and small-for-gestational-age infants are more likely to occur in cases of inadequate gestational weight gain (GWG). Which themselves are linked to a higher chance of developing metabolic and cardiovascular diseases later in life. (Aoyama et al., 2022)According to recent studies done in Ethiopia, the prevalence of pregnant women gaining too much weight varied from 2.7% in Harari to 6.1% in Addis Ababa. (Alebachew et al., 2021)

Despite all the mentioned problems of inappropriate gestational weight gain, there are no available studies which show the prevalence of gestational weight gain in the study area and studies which identify associated factors that guide the concerned body to take preventive action. Moreover, the factors associated with gestational weight gain in relation to the study area should be identified in order to take the necessary public health intervention.

There is no published evidence that addresses gestational weight gain and associated Factor among pregnant women in the health facilities in Garowe, Puntland, Somalia. It is necessary, therefore, to assess gestational weight gain and associated factor among pregnant women in the urban area of north-eastern Somalia.

This study result may help to interests and helpful of public health authorities of Puntland state specially Garowe city regional health office ministry health of Puntland zonal health offices and other stakeholders also this study area on the need to re-assessment current strategies by making sure that various contributing factor gestational weight gain among pregnant and have been identified in addition.

1.3. SIGNIFICANCE OF THE STUDY

The results of this study could help fill the knowledge gap regarding GWG among expectant mothers who visit ANC health facilities in the research region. The results of this study will helping program managers, city health offices, and health facilities in Garowe City implement interventions and address factors related to GWG pregnant mothers. This will help to better plan, implement, and monitor efforts to reduce maternal and child morbidity and mortality and to raise awareness among all relevant parties. This research will help to others who are interested in maternal health in general, in addition to the medical professionals and the Puntland Ministry of Health. Additionally, this study's goal is to produce a thesis

1.4 Objectives

1.4.1. General objectives

- To assess the magnitude of gestational weight, gain and associated factor among pregnant women attending antenatal care in public and private health facilities in Gar-owe city Puntland Somalia from 15 July to 15 August 2024

1.4.2. Specific objectives

- To identify the magnitude of gestational weight, gain among pregnant women attending antenatal care in public and private health facilities in Gar-owe city Puntland Somalia
- To identify factors associated with gestational weight gain among pregnant women attending antenatal care in public and private health facilities in Gar-owe Puntland Somalia

2. LITERATURE REVIEW

2.1. Magnitude of Gestational weight gain

A study found that pregnant Asian Indian women gained weight across all BMI categories. Women who were 30.5% underweight, 23.4% normal weight, 22.5% overweight, and 37.1% obese met the recommended weight gain guidelines. Obese women gained 28.5% more weight and 34.4% less than recommended, while most underweight (66.2%), normal-weight (69.4%), and overweight (68.8%) women gained less. (Bhavadharini et al., 2017b)

A 2010 study conducted in Taiwan found that 44.4% of women gained weight above the IOM-recommended cut-point, 18.3% went below it, and 37.3% went above it. According to a different study done in Indonesia in 2001, only 21% of the women had total weight gains within the range recommended for women in their category of early pregnancy BMI, and 79% of the women had weight increases above the IOM's recommended range. Only 17.6% of women who were underweight had increased their gestational weight in compliance with the IOM's guidelines. (Chang et al., 2010)

Research released in the US reveals that the average total GWG of adult women of normal weight who gave birth to full-term babies varied from 10.0 to 16.7 kg. Thus, based on IOM categories, 25% of women gained too much weight during pregnancy, 39% gained enough weight, and 36% gained too much weight. A study conducted in the same region found that women who were overweight or obese had higher rates of excess weight gain (61% and 53%, respectively). (Ukah et al., 2019)

According to a study done in Rio de Janeiro, Brazil, women gain inadequate, adequate, and excessive gestational weight at rates of 23.1%, 27.5%, and 48.9%, respectively. (Fraga and Theme Filha, 2014)

A population-based study conducted in Bangladesh found that the mean GWG from enrollment to 36 weeks was only 6.5 kg, which is 75% less than the IOM recommendations. (Kac et al., 2019)

In the study population, 32.0% gained weight in compliance with recommendations, 20.9% gained insufficient weight, and 47.2% gained excessive weight. The prevalence of insufficient gain was Highest among underweight women (39.3%), whereas the prevalence of excessive gain was highest among overweight and obese class I women (64.1% and 63.5%, respectively).(Deputy et al., 2015)

In research carried out in sub-Saharan Africa the percentage of GWG was reported in sixteen studies in accordance with IOM guidelines. The range of women with insufficient GWG was 15.7% to 96.6%. Women who had sufficient GWG varied in percentage, from 3% to 62%. Out of the 16

Studies, nine of them stated that more than 50% of women had inadequate GWG, while less than 30% of women had adequate GWG. The lowest proportion of insufficient GWG

South Africa accounted for the largest share of excessive GWG (55.5%) and the lowest percentage (15.7%). The percentage of women with excessive GWG was less than 20 in 11 out of the 16 studies. (Asefa et al., 2020) according to research done in Nigeria across the three categories, the prevalence of GWG was excessive (56.3%), adequate (16.8%), and insufficient (26.9%). (Adeoye et al., 2023)

According to other research conducted in the Harari region of Eastern Ethiopia, 69.3%, 28%, and 2.7% of the women gained inadequate, adequate, and excessive gestational weight, respectively. Overweight during pregnancy. Measuring women according to their BMI in the early stages of pregnancy, only 7.7% are underweight, 24% have a normal BMI, 51.7% are overweight, and 62.5% are obese and have gained enough gestational weight. (Asefa and Nemomsa, 2016b)

The crucial lack of primary, localized data on gestational weight gain (GWG) and its particular causes in Garowe, Puntland, Somalia, is the research gap. Without context-specific evidence, contemporary healthcare providers are unable to effectively manage suboptimal GWG, a substantial risk factor for severe unfavorable maternal and newborn outcomes. In order to improve maternal and child health outcomes in this vulnerable population, policymakers will be able to create focused, evidence-based nutritional and clinical interventions thanks to this study, which will provide the first comparative data on GWG prevalence and related factors across public and private health facilities.

2.2. Factors affecting gestational weight gain during pregnancy

2.2.1. Socio demographic factor

In an Iranian study, the average age of the women was 26.61±4.71 years, and 49% of them had completed high school. Over half (54.5%) of the women had their first pregnancy, with a mean of 1.70±0.94 pregnancies. (Ebrahimi et al., 2015)

According to a different Irish study, women with lower levels of education were also significantly shorter and had higher pre pregnancy BMI and early pregnancy weight. Compared to women in the secondary education group, fewer women with tertiary education had a BMI > 30 kg/m2 (26.8% vs. 46.3%, $p<0.001$). Compared to women with lower education levels, those in the tertiary education group were more likely to be Caucasian, older, and have lower parity. According to the IOM guidelines, women with lower educational attainment were more likely to have excessive (AOR 1.182) and inadequate (AOR 1.284) GWG when controlling for intervention, maternal age, parity, and ethnicity using random effects. (O'brien et al., 2019)

Insufficient weight gain was found to be significantly correlated with mother age and family income in another study done in southern Brazil. (Drehmer et al., 2010)

A study carried out in the Harari region of Ethiopia reveals that the mean age of women was 25.2 (SD ±5.01) years, with 65.2% of them falling between the ages of 20 and 29. The majority of responders (94.6%) were married, 25.8% were illiterate, 16.5% went to college, 44% belonged to the Oromo ethnic group, 55.2% were Muslims, 81% lived in cities, and 52.6% were stay-at-home moms. Eighty-four percent of the participants began their ANC follow-up between the ages of eight and twelve weeks. (Asefa and Nemomsa, 2016b)

2.2.1. House hold food insecurity

A study carried out in Chicago, USA, found that food insecurity is a common issue that might also be linked to weight gain during pregnancy. A lower total gestational weight gain but not an excessive gestational weight gain was associated with inadequate food security, according to the 2009 National Academy of Medicine classifications. (Cheu et al., 2020)

It was discovered in this Brazilian study that 56.4% of the mothers had some exposure to HFI during their pregnancies. HFI in a group of expectant mothers visiting a PHC in northeastern Brazil, and found that the sample had a prevalence of 42.7% of HFI, which is less than the findings of this study. Furthermore, we chose to use the total of the two most severe HFI levels (severe and moderate) in

the current investigation. Consequently, it was found that 12.3% of women had less access to food than had been previously reported, both in terms of quantity and quality, and that they may still be hungry. When examining HFI in expectant mothers in two Rio de Janeiro cities

(14.9%) (Aléxia Vieira De Abreu Rodrigues et al., 2021b) A study conducted in Ethiopia showed that 103 (26.5%) women were food secure, and 288 (73.5%) of them were food insecure. Pregnant women who were food insecure were less likely than those who were food secure to have adequate GWG (AOR = 0.44, 95%CI: 0.21 to 0.94). (Arero, 2022)

2.2.3. Pre pregnancy BMI

A 2010 Canadian study of pregnant women found that those who were overweight or had a higher pre-pregnancy BMI were more likely to gain more weight than was recommended (55% vs. 41% vs. 26%) than those who were normal or underweight. Nevertheless, young mothers were more likely to gain weight than was advised (56% vs. 35%) than older mothers, and underweight and normal-weight women were more likely to fall within (47% vs. 34% vs. 31%) and below (27% vs. 25% vs. 14%) recommendations than overweight mothers. Compared to women who had more than one birth, those who gave birth for the first time were more likely to gain 22 more pounds than was advised (47% vs. 37%; AOR = 1.5, 95% CI of 1.3 to 1.7). a lesser degree of education. (Lowell and Miller, 2010)

Obese women who engaged in frequent pre-pregnancy physical activity gained more weight than expected. It is possible that women who reduce their physical activity during pregnancy gain excess weight; however, we were unable to assess the change in physical activity because these data were not available. Obese people may also be more likely to over report physical activity than their non-obese counterparts, which could explain why this finding only applies to obese women. Nonetheless, physical activity is recommended for women with uncomplicated pregnancies and has been linked to decreased weight gain. (Deputy et al., 2015)

2.2.4. Minimum dietary diversity

According to an Algerian study, Algerian women are suffering from inadequate gestational weight gain due to poor maternal nutritional intake and a lack of variety in their diets. (Tebbani et al., 2018)

It has been shown that dietary diversity intake influences GWG in both high- and low-income countries. Unhealthy eating habits during pregnancy have been linked to a higher risk of negative Pregnancy outcomes. Despite this, this study's respondents had only 19.9% [95% CI: 16.7, 22.6%] appropriate and 80.1% inappropriate dietary practices, and their relationships with inappropriate GWG were explored. (Demilew et al., 2020)

2.2.5. Behavioral factor

A study conducted in Austria found that smokers had an increased gestational weight gain. Although the majority of the women in the study were nonsmokers, more than 30% continued to smoke while pregnant. Among these smokers, more than 30% while non-smokers gained excessive weight during pregnancy.(Naja et al., 2016)

This is supported by a study conducted in the United States. More than a third (34.3%) of pregnant former smokers had at least one diagnosable psychiatric disorder. A lifetime history of alcohol use disorder was associated with a significantly higher GWG. The researchers conclude that women who stop smoking during pregnancy gain a significant amount of gestational weight, and that a history of alcohol use disorder is linked to GWG. (Levine et al., 2015) Cigarette smoking taken together, early studies examining associations between decreasing GWG and amount of reported smoking show inconclusive results. (Naja et al., 2016)

2.3. Conceptual framework for GWG

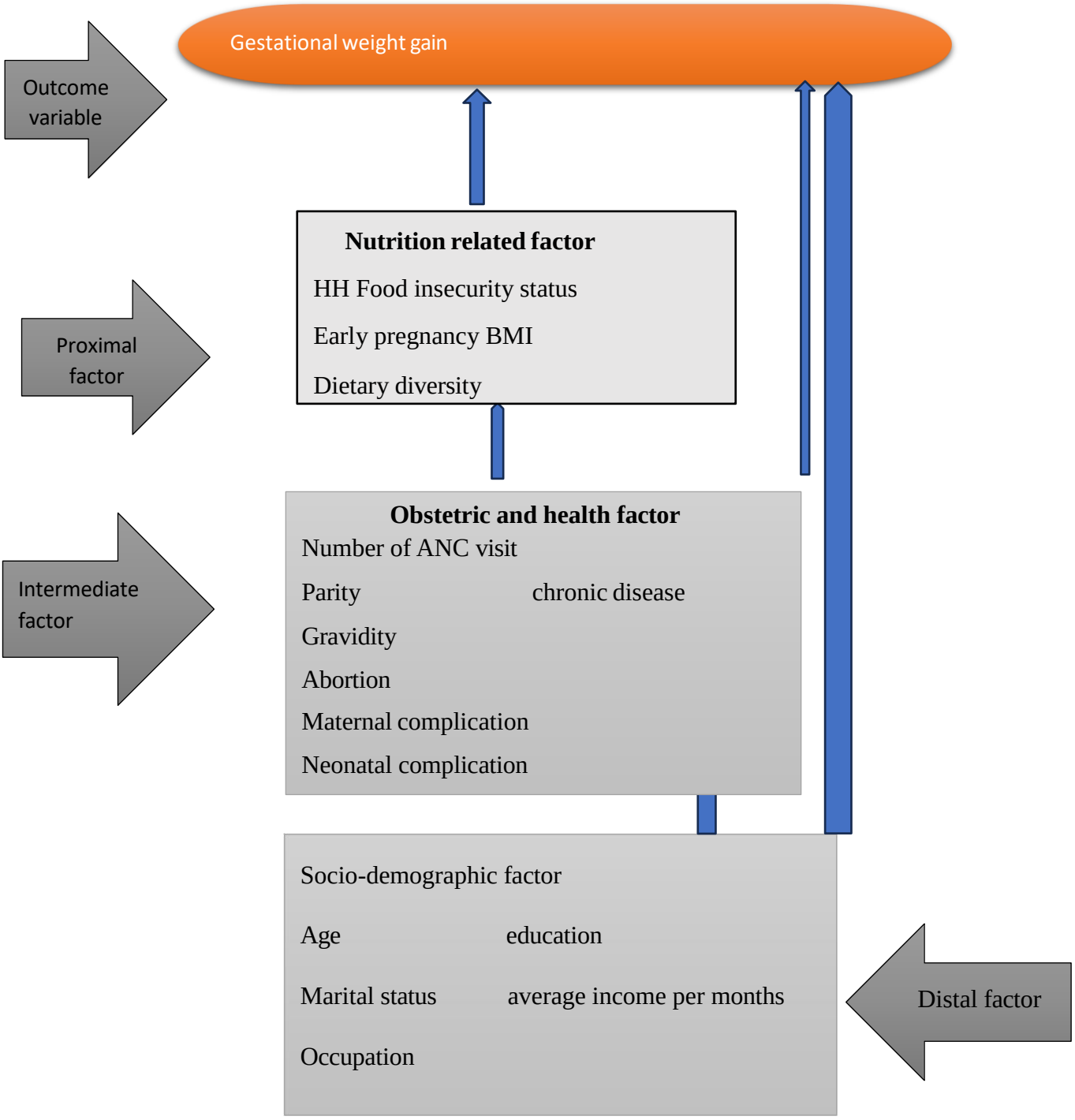

Figure 1Framework diagram for GWG and associated factor among pregnant women in Garowe city 2024 Source: Institute of medicine (IOM,2009)

3. METHODS AND MATERIALS

3.1. Study area/setting and period

The study was conducted in Gar-owe, the capital city of Puntland state in northeastern Somalia. Gar-owe is located in Nugal region and is the third largest city in Puntland, with an estimated total population of 190,000 residents, including a significant number of displaced people. Gar-owe has a hot climate, and the weather is generally hot, sunny, and dry. The average temperature reaches a maximum of around 41 °C over the summer period. Annual rainfall is low, averaging 123mm. The main ethnicity of the region is Somali. There are non-governmental organizations in Gar-owe. Gar-owe City has one public referral hospital, five hospitals, and seven health centers. The city has 100% health service coverage and more than 80% educational coverage. This study was be carried out in public and private health facilities that provide health services to over one million people with six primary departments (Gar-owe, G.H., 2019 unpublished row data). Among these is the maternity department, where this research was be conducted among pregnant women attending there from July 15, 2024, to August 15, 2024.

3.2. Study design

Health institution- based cross-sectional study design was applied.

3.3. Population

3.3.1. Source population

All pregnant women come for antenatal care in both public and private health facilities in Gar-owe, Puntland, Somalia.

3.3.2. Study population

Pregnant women who visited antenatal care in the selected public and private health facilities in Gar-owe, Puntland, Somalia.

3.4 Inclusion and exclusion criteria

3.4.1. Inclusion criteria

Pregnant women who started antenatal care (ANC) visit during first trimester (started their ANC visit at ≤16 weeks of gestation) and in their third trimester during the study period.

3.4.2. Exclusion criteria

Cards of clients with incomplete data (information) or lost cards for secondary data were also excluded.

3.5. Sample size determination

3.5.1. Sample size calculation for first objectives

The sample size was calculated using the standard formula for estimating a single proportion, considering a 95% confidence level, a 5% margin of error, and the prevalence of inadequate gestational weight gain in a study conducted in Ethiopia. (Engidaw et al., 2023)is considered since no previous studies that clearly show the prevalence percentage have been done in Somalia. To compensate for the non-response rate, 10% of the determined sample size was added.

1. $n = (Z\alpha/2)^2\, pq/d2$ = (1.96)²(0.2153*0.7847)/0.0025 =260

2. n = initial sample size
3. z = the standard normal value at the level of confidence desired, usually at 95% CL.
4. p = prevalence in adequate GWG = 0.2153
5. q = 1-p
6. d = desired degree of precision = 0.05
7. = design effect = 1.5
8. 10% of the non-response rate
9. The final sample size will be 429.

3.5.2. Sample size determination for second objectives

The sample size for identifying factors associated with gestational weight gain among pregnant women was determined using the double population proportion formula in Epi info version 7. The calculation was based on key assumptions: a 95%confidence level, 80% statistical power, and consideration of odds ratios for variables previously shown to have significant associations with gestational weight gain. To account for possible non-response, 10% was added to the estimated sample size.

Table 1 sample size determination for different factors associated with gestational weight gain among pregnant women in Gar-owe,Puntland,Somalia 2024.

No	Associated factor	Ratio (unexposed: exposed	% outcome in unexposed	OR	Sample size+(10% non-response rate)	Reference
1	Early pregnancy BMI	1.1	75.8	2.9	121	(Asefa and Nemomsa, 2016a)
2	Frequency of eating	1.1	52.4	2.5	202.4	(Asefa and Nemomsa, 2016a)
3	Food insecurity	1.1	13.7	1.26	83.6	(Misgina et al., 2021a)

Finally, the required sample size for this study was established by selecting the maximum sample size obtained from the first objectives which is 429.

3.5.3. sampling procedure and sampling technique

The city has 12 health facilities; out of these, six (Three Hospitals and Three Health Centers) were selected by simple random sampling method. The final sample size for this study is 429, the total number of pregnant women who visit Gar-owe general hospital, Yeshfin hospital , Qaran hospitals, Jowle, Jilab, and Gambol health centers per month is 600, 550, 400, 200, 250, and 180, respectively. Therefore, the required sample size from selected hospitals and health centers is: Garowe General Hospital (118); Yeshfin Hospital (108); Qaran Hospital (79); Jowle Health Center (39); Jilab Health Center (49); and Gambol Health Center (35). Then systematic random sampling was be used to select participant.systematic.

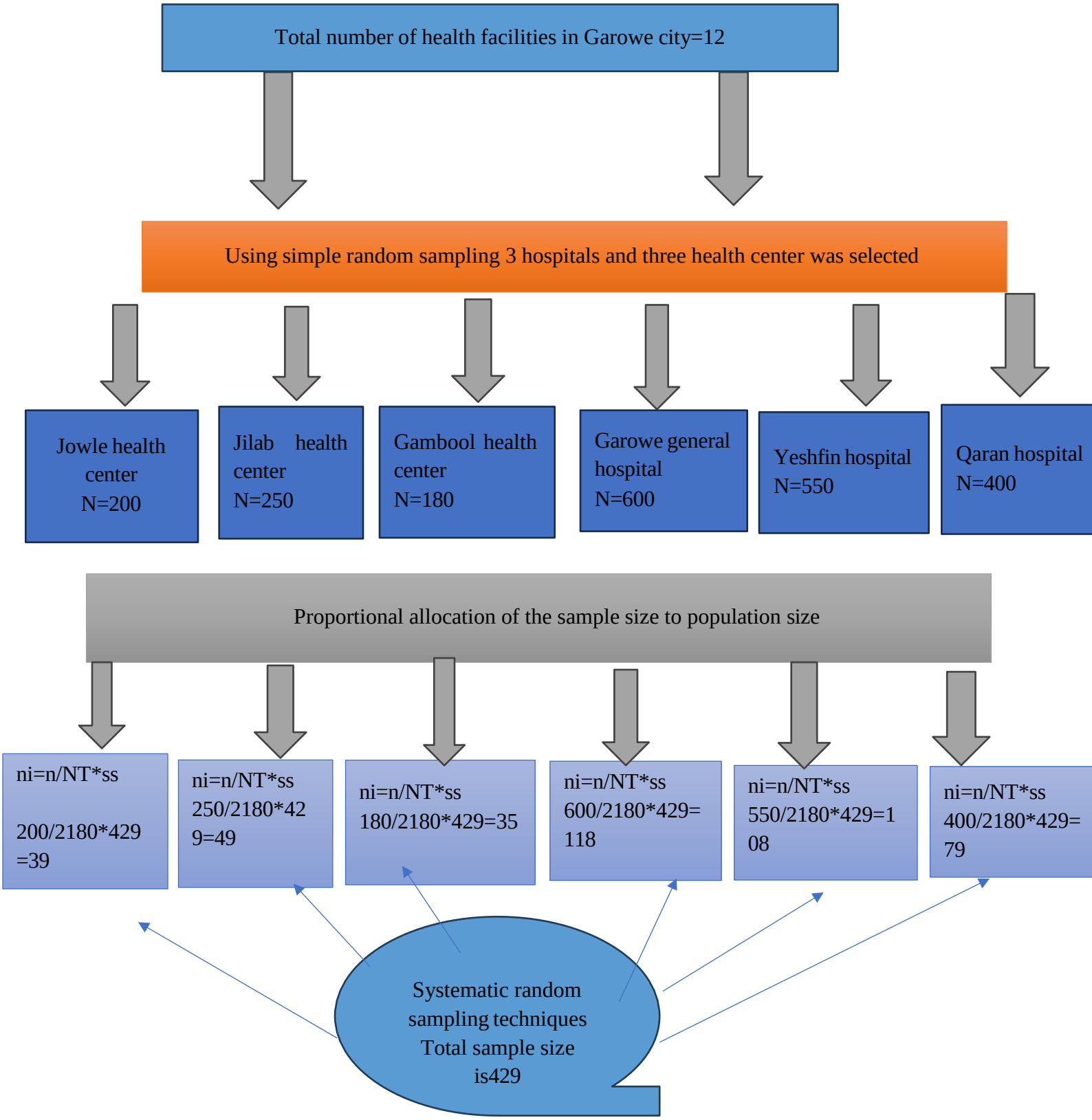

Figure 2 schematic presentation of sampling procedure for assessing gestational weight gain and associated factor among pregnant women attending antenatal care in Public and Private Healthy facilities in Garowe.

3.6. Data collection method

3.6.1. Data collection tools

Data was collected using a structured questionnaire created after reviewing various pieces of literature. The questionnaires cover socio-demographic, obstetric history, anthropometry, dietary diversity, and household food insecurity. The outcome variable, weight, was measured using a standard weight measurement. The questionnaire was primarily written in English, translated into (Af-Somali) by language experts, and then translated back into English by another expert to ensure consistency and accuracy. In other words, we collected weight records at each ANC visit using secondary data from the reproductive health integrated card. The mothers' weight was measured using a standardized weight scale during data collection. Questionnaires for primary data were adapted from various pieces of literature.

3.6.2. Data collectors and supervisors

Two diploma public health and two diploma clinical nurses was be recruited as data collectors, and one Bachelor of Science (midwives) was recruited as a supervisor. All of them was trained for two days on how to approach and recruit study participants, interview techniques and methods of interviewing, and filling out the questionnaires. Data collectors was responsible for interviewing the study participant consistently, recording the result, and finally submitting the result to the investigator as scheduled, while the supervisor was coordinating and monitoring the different data collection tasks. The primary investigator provided one-day training on the study's purpose, informed consent, information confidentiality, interview techniques, and secondary data collection. First, the purpose and methodology of the study was explained to the participants in order to avoid social desirability bias.

3.6.3. Data collection procedure

Two-day training was given to data collectors and supervisors of data collection. Was teaching how to fill out questionnaires and how to approach respondents with structured questionnaire used to collect data using face-to-face interview techniques by trained nurses to obtain in Public and Private Health facilities in Gar-owe district Puntland Somalia. From15 June July 15, 2024 sociodemographic information, household food insecurity, minimum dietary diversity, and other clinical conditions the secondary data like weight at the 1st, 2nd and 3rd visits, maternal height, and parity was collected by using a checklist from the integrated reproductive card at each antenatal

Care visit, and the last maternal weight (before delivery) was also be measured by data collectors with a digital weight scale with a minimum closing. Their weights were measured to the nearest

0.1 kg on portable digital scales that were regularly calibrated. A portable stadiometer was used to measure the woman's height to the nearest 0.1 cm, with her head positioned in the Frankfort plan (Inskip et al., 2021). For managing the structured questionnaire, the supervisor was collecting the checklists after checking their completeness and consistency.

3.7. Variables of the study

3.7.1. Dependent variable

- Gestational weight gain

3.7.2. Independent variable

- Sociodemographic (age, marital status, educational status, occupational status, and income per month)
- Obstetric and health factor (number of ANC, parity (number of births given), and gravid (number of pregnancy), abortion, maternal complication, neonatal complication, chronic disorder)
- Anthropometric and nutrition-related factors (early pregnancy BMI, household food insecurity status and dietary diversity)

3.8. Operational definitions

Total gestational weight gains: The difference between the last recorded weight before delivery and the first measured weight in early pregnancy (before or during the first trimester) is classified as being within or outside the recommended range (IOM, 2009).

Adequate GWG: is a normal weight gain for each woman's IOM-recommended early pregnancy BMI category, which is 12.5-18 kg for underweight and 11.5-16 kg for normal weight. Overweight individuals weigh 7-11.5 kg, while obese

individuals weigh 5-9 kg (IOM 2009).

Inadequate GWG: Is weight gain less than the IOM recommendation for each woman's early pregnancy BMI category? Underweight is defined as a weight of < 12.5kg, normal weight as <11.5kg, overweight as <7kg, and obese as <5kg (IOM 2009).

Household food insecurity: categorizes households into four levels of household food insecurity (access): food secure, and mild, moderately and severely food insecure. Households are categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently. (Coates et al., 2007).

Food Secure Household: Experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. (Coates et al., 2007).

A Mildly Food Insecure (Access): household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating. (Coates et al., 2007)

A Moderately Food Insecure: household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions. (Coates et al., 2007)

A Severely Food Insecure: household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure.(Coates et al., 2007)

Dietary diversity: is the sum of nine groups starchy staples (cereals and white tubers), dark green leafy vegetables, other vitamin A rich fruits and vegetables, other fruits and vegetables, organ meat, meat and fish, eggs, (legumes, nuts and seeds), milk and milk products eaten by the women over last 24 hours. The score range was 0-9; with the maximum score was 9 and minimum (Arimond et al., 2016).

3.7. Data quality assurance/management

Questionnaires was Written in English first, then translated into the local language (Af-Somali) and returned to English for consistency by various language experts. All data collectors and supervisors was be given orientation and training on how to conduct interviews and record data before being assigned to each health facility. After providing the training, a pretested was be conducted in 5% of the sample size in Public and Private Health Facilities in Garowe, Puntland Somalia the data was evaluated for the appropriateness of the wording, clarity of the questions, and respondent reactions to the questions and interviewer, to ensure the quality of the data, supervisors and the investigator provided close supervision and monitoring throughout the collection period.

Finally, the supervisor and investigator verified the collected data's completeness.

3.8. Data processing and analysis

Data were firstly entered into kobo Toolbox, cleaned in Microsoft Excel, and then exported to Stata version 17 for analysis. Descriptive statistics were applied to summarize the characteristics of the study participants, and proportions were calculated to estimate the prevalence of gestational weight gain. To identify factors associated with gestational weight gain bivariate logistic regression analysis was conducted. Multicollinearity was assessed and variables without collinearity problems (VIF=0.34) were included in the subsequent regression models. Variables with a p-value<0.25 in the bivariate analysis were further entered into multivariable logistic regression model to adjust for potential confounders. The fitness of the model was assessed using Hosmer-Lemeshow goodness- of-fit test P=0.5). Finally, multivariable logistic regressions was performed to determine the independent predictors of Gestational Weight Gain and adjusted odd ratio with 95% CI and the P value less than 0.05 was reported. According to the institute of medicine (IOM) criteria, GWG was classified into three categories inadequate, adequate and excessive 4 respondents who gained excessive weight were excluded from the logistic regression analyses.

3.9. Ethical consideration

Ethical clearance will obtained from the Haramaya University College of Health and Medical Sciences Institutional Health Research Ethics Review Committee (IHRERC). An official letter was written from the Ministry of Health of Puntland, Somalia, in Gar-owe. And data collection was began after permission and cooperation was given to the Ministry of Health in Puntland. The study title, purpose, procedure, and duration, as well as the possible risks and benefits of the study, were clearly explained to the heads of health facilities and participants. Then individually informed, voluntary, written, and signed consent was obtained from the heads of health facilities and the pregnant mothers. For pregnant women aged <18 years, consent was obtained from their parents, spouses, or legal guardians. The respondents was be assured of confidentiality by excluding their names during the period of data collection. They must be well informed that they have the full right to totally refuse to participate and/or withdraw from the study at any time if they have any difficulties.

3.10. Plan for information dissemination

The result of this study will disseminated to the School of Public Health at Haramaya University as a requirement for the fulfillment of postgraduate study. The study findings was also be submitted to the Gar-owe administrative health bureau for the purpose of planning health projects on gestational weight gain among pregnant women as a public health problem and to concerned and interested organizations. Efforts was made to publicize the project in national and international journals.

4. RESULTS

4.1 Sociodemographic characteristics of the respondent

In this study 412 participant were included (respond rate 96%). The mean age of the respondents was 25.99 (SD=5.70) years and 213(51.70%) were in the age group of 15-25 years. Three hundred thirty-nine (82.28%) were currently married and 181(43.93%) were no formal education. three hundred sixty-six (88.83%) of the participants were urban residents. One hundred ninety- six (47.55%) of the respondent were housewives, and 47.82% were earning an income 100-200$ per month (Table2).

Table 2: Socio demographic characteristics of gestational weight gain and associated factor among pregnant women in public and private health facilities in Gar-owe Puntland Somalia, 2025

Variable	Categories	Frequency	%
Mother age (years)	15-25	213	51.70
	26-34	156	37.86
	>35	43	10.44
Marital status	widowed	15	3.64
	Divorced	58	14.08
	married	339	82.28
Place of residence	Rural	46	11.17
	Urban	366	88.83
Occupation	Private organization	62	15.05
	Government employee	61	14.81
	House wife		
	Student	196	47.57
		93	22.57
Education	No formal education	181	43.93
	College and above	90	21.84
	Primary	69	16.75
	secondary	72	17.48
Income per months in USD	100-200	197	47.82
	300-400	156	37.85
	>500	59	14.32

4.2 Obstetric and health history of respondent

Regarding the obstetric and health history of respondent 348(84.47%) were multigravida and 205(49.76%) received their first ANC during the 8-12 weeks of pregnancy. In this study 278 (67.48%) of women were multiparous and 16.50% of respondents had history of abortion in the past pregnancy, where all of the abortions were spontaneous. Also, the study shows 49 (11.89%) had faced maternal complication in the previous pregnancy and 379(91.99%) of pregnant mothers were interested and have intention of the pregnancy (Table3).

Table 3 obstetric and health factors associated with gestational weight gain in public and private health facilities in Gar-owe Puntland, Somalia, 2025

Variable	**Categories**	**Frequency**	**%**
Gravidity	Prim-gravida	64	15.53
	Multi-gravida	348	84.47
Time of ANC initiation	Less than 8 weeks	12	2.91
	8-12 weeks	205	
	13-16weeks	195	49.76
			47.33
Parity	Nulliparous	53	12.86
	Primiparous	67	16.26
	multiparous	292	70.87
Abortion history	Yes	68	16.50
	No	344	83.50
Number of abortion	One	52	76.47
	Two	16	23.53
Any maternal complication in the previous pregnancy or delivery	No	363	88.11
	Yes	49	11.89
Type of maternal complication faced	PPH	8	16.33
	APH	12	24.49
	Abortion	24	48.98
	Obstructed labor	4	8.16
	Sepsis	1	2.04

Any neonatal complication during the previous pregnancy	Yes No	42 370	10.19 89.81
Type of neonatal complication	Birth defect Breathing problem Low birth weight Neonatal jaundice Still birth preterm	1 25 6 4 3 3	2.38 59.52 14.29 9.52 7.14 7.14
Have you had any known chronic medical disorder	Yes No	25 387	6.07 93.93
Type of chronic disorder	Hypertension Diabetes	15 10	60.00 40.00
Current pregnancy interest(intention)	Yes No	379 33	91.99 8.01
Obstetric problems in the current pregnancy	Yes No	3 409	0.73 99.27
Any medical disorder in the current pregnancy	Yes No	3 409	0.73 99.27
Birth spacing	Short interval Optimal interval	383 29	92.96 7.04
Duration of the current pregnancy	Less than 37 weeks Greater or equal to 37 weeks	321 91	77.91 22.09

4.3 Nutrition related factor

4.3.1 Dietary diversity practice of the participant

Based on the 24h dietary recall, the mean (±SD) of dietary diversity score of pregnant women in the study area was 5.04(±1.72) food groups and below the half of them 175(42.48%)had inadequate dietary diversity (<5 food groups). Among the participant 371(90.05%) of them consumed starch and staple food groups fallowed by pulses 345(85.92). Consumption of dark green leafy vegetables was relatively low with 94(22.82) (Figure 3)

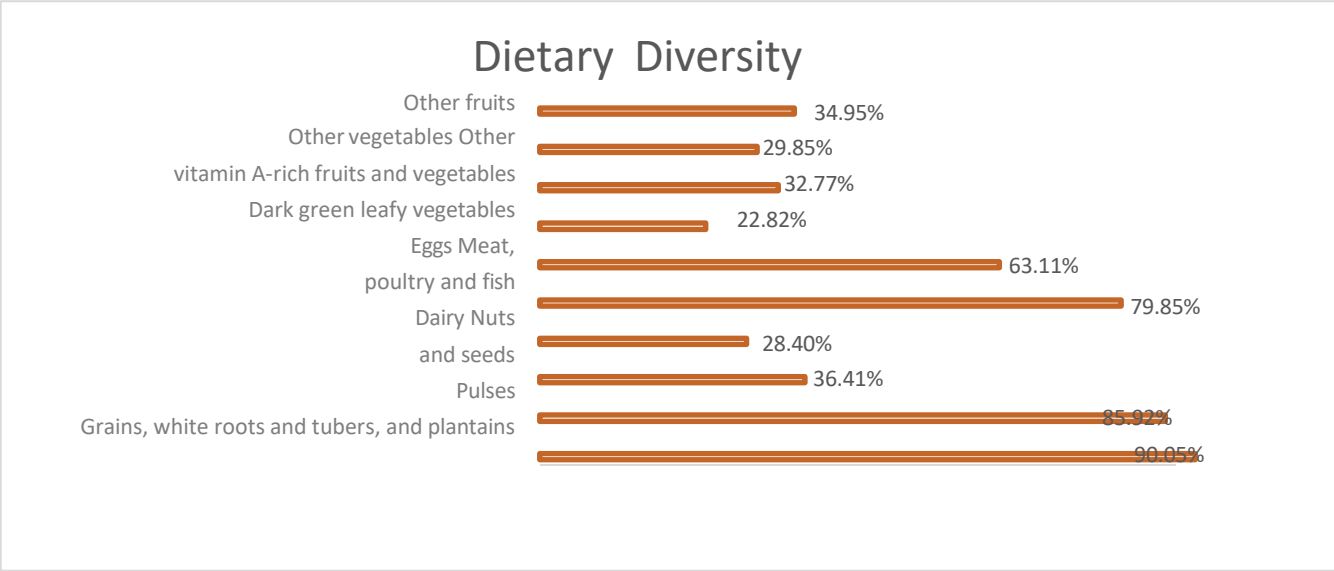

Figure 2 dietary diversity of gestational weight gain and associated factor among pregnant women attending antenatal care in public and private health facilities in Gar-owe Puntland, Somalia, 2025

4.3.2 House hold food insecurity access scale

Depending on the household food insecurity access scale_ (HFIAS**)** developed by FANTA, 34.22% of the respondent household were food secured and 18.93% were severely food insecure (Figure4)

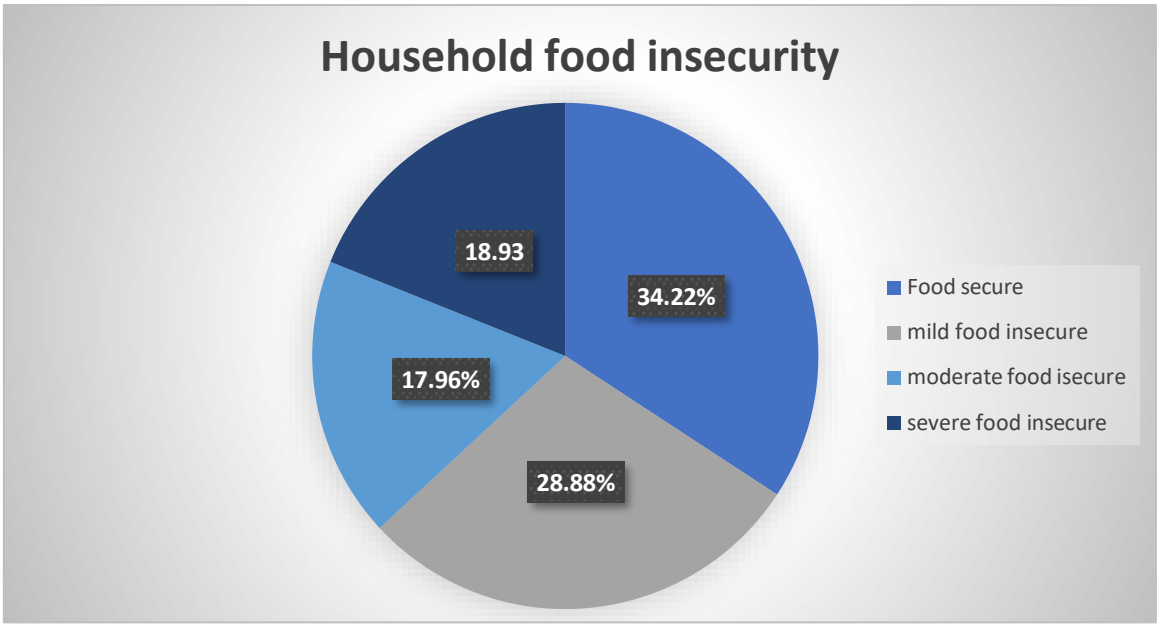

Figure 3 Household food insecurity of gestational weight gain and associated factor among pregnant women attending antenatal care in public and private health facilities in Gar-owe Puntland, Somalia, 2025

4.3.3 Magnitude of inadequate gestational weight gain

This result reveals that the mean (±SD) weight gain during pregnancy was 8.22(±1.73) and 234(57.35%) (95%CI: 52.4, 62.08) of the women gained inadequate weight during their current pregnancy. The mean BMI (±SD) of the respondent at early pregnancy was 23.14kg/m² ± 6.00 and 8.22(SD=1.73) and 117(28.40%) had normal body weight (BMI 18.5-24.99kg/m²)whereas 138(33.50%) were underweight (BMI <18.5kg/m²). On the other hand, 98 (23.79%) and 59 (14.32%) of the mothers were overweight and obese, respectively.

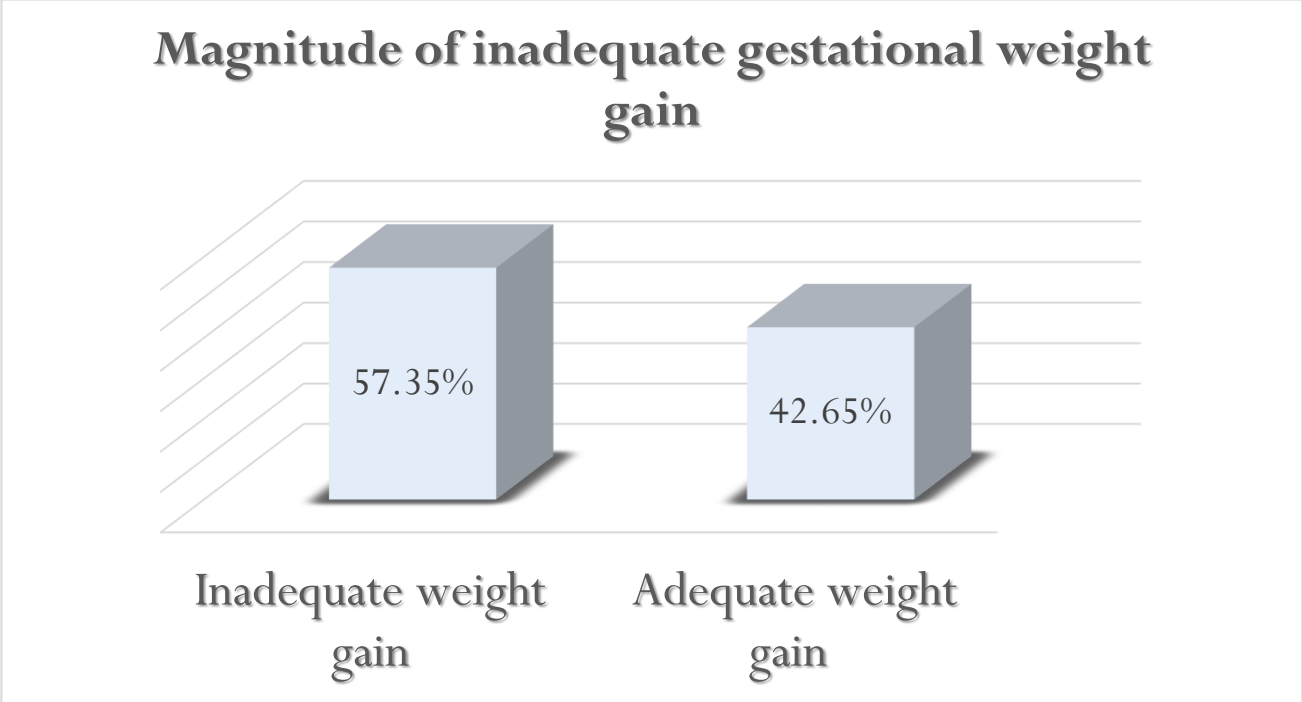

Figure 4 magnitude of inadequate gestational weight gain and associated factor among pregnant women attending antenatal care in public and private health facilities in Gar-owe Puntland, Somalia, 2025

4.4 Factors associated with gestational weight gain

4.4.1. Factors associated with gestational weight gain in bivariate analysis

Bivariate logistic regression analysis was used to check crude association of independent variable with GWG. Variables such as education, family income, occupation, history of abortion, maternal complication in the previous pregnancies , gravidity, early pregnancy BMI, duration of the current pregnancy, parity , and HFI were associated with GWG at p-value<0.25 and considered as candidates for multivariable analysis (Table 4)

Table 4: Bivariate analysis of factors associated with gestational weight gain among pregnant women in public and private health facilities in Gar-owe Puntland Somalia, 2025

Independent variables	Category	GWG		COR(95%CI)	P-value
		Inadequate N(%)	Adequate N(%)		
Education	College and above	64(71.11)	26(28.89)	1	1
	No formal education	95(52.49)	86(47.51)	0.44(1.29-3.82)	0.004
	Primary	40(57.99)	29(42.03)	0.56(0.92-3.45)	**0.086**
	Secondary	35(51.47)	33(48.523)	0.41(1.20-4.48)	0.012
Marital status	Widowed	9(3.85)	6(3.45)	1	1
	Divorced	31(13.25)	25(14.37)	1.48(0.37-3.85)	0.748
	Married	194(82.91)	143(82.18)	0.9(0.38-3.17)	0.852
Age	15-25	121(51.71)	89(51.15)	1	1
	26-34	89(38.03)	66(37.93)	1.00(0.66-1.53)	0.970
	>35	24(10.26)	19(10.92)	1.07(0.55-2.08)	0.827
Place of residence	Rural	30(65.22)	16(34.78)	1	
	Urban	204(56.35)	158(43.65)	0.68(1.35-4.54)	0.254
Family income	300-400	103(66.03)	53(33.97)	1	1
	100-200	101(66.03)	96(33.97)	1.84(1.19-2.84)	**0.006**
	>500	30(54.55)	25(45.45)	0.79(0.65-5.74)	0.667
Occupation	Private organization	27(45.00)	33(55.00)	1	1
	Government employee	23(37.70)	38(62.30)	1.35(0.65-2.79)	0.416
	House wife	133(68.56)	61(31.44)	0.37(0.20-0.67)	**0.001**
	Student	51(54.84)	42(45.16)	0.67(0.35-1.29)	0.235

History of abortion	No Yes	200(85.47) 34(14.53)	140(80.46) 34(19.54)	1 1.42(0.84-2.40)	1 **0.18**
Maternal complication in the previous pregnancies	No Yes	211(90.17) 23(9.83)	148(85.06) 26(14.94)	1 1.61(0.88-2.93)	1 **0.118**
Neonatal complication	Yes No	25(10.68) 209(89.32)	17(9.77) 157(90.23)	1 1.10(0.57-2.11)	 0.76
Chronic disorder	Yes No	16(64.00) 218(93.16)	9(36.00) 165(43.08)	 0.74(0.32-1.72)	1 0.489
Pregnancy interest (intention)	No Yes	17(7.26) 217(92.74)	16(9.20) 158(90.80)	1 0.77(0.37-1.57)	1 0.480
Any medical disorder in the current pregnancy	Yes No	2(0.85) 1(0.57)	232(99.15) 173(9.43)	1 1.49(0.13-16.58)	1 0.745
Dietary diversity score	Adequate Inadequate	140(59.83) 94(54.34)	95(54.60) 79(45.60)	1 1.23(0.83-1.84)	1 0.291
Gravidity	Prim-gravida Multi-gravida	47(20.09) 17(9.77)	187(90.23) 157(90.23)	1 2.32(1.28-4.20)	1 **0.000**
Early pregnancy BMI	Normal and above Underweight	190(69.34) 44(32.84)	84(30.66) 90(67.16)	1 0.21(2.97-7.20)	1 **0.005**
Gestational age	≥37 weeks <37 weeks	71(78.02) 163(51.42)	20(21.98) 154(48.58)	1 0.29(1.94-5.77)	**1** **0.000**
First ANC visit	<8 weeks 8-12 weeks 13-16 weeks	8(3.42) 112(47.86) 114(48.72)	3(1.72) 92(52.87) 79(45.40)	1 2.19(0.56-8.49) 1.84(0.47-7.18)	1 0.257 0.375
Birth spacing	Short interval Optimal interval	217(57.26) 17(58.62)	162(42.74) 12(41.38)	1 0.94(0.43-2.03)	1 0.886
Parity	Nulliparous Primiparous Multiparous	35(66.04) 44(65.67) 155(53.82)	18(33.96) 23(34.33) 133(46.18)	1 0.98(0.47-2.17) 0.59(0.90-3.08)	1 0.967 **0.102**

HFIAs	Food secure	85(61.15)	54(38.85)	1	1
	Mild food insecure	77(64.71)	42(35.29)	0.85(0.56-1.42)	0.556
	Moderate food insecure	40(54.79)	33(45.21)	1.29(0.73-2.30)	0.372
	Severely food insecure	32(41.56)	45(58.44)	2.21(1.25-3.90)	**0.006**

4.4.2 Factors associated with gestational weight gain in multivariable analysis

In the multivariable logistic regression analysis, women with no formal education were found to be 2 times more likely to experience inadequate weight gain during pregnancy as compared to women with college and above education levels (AOR = 2.06 95% CI: 1.07-3.95). Multigravida women were 4.82 times more likely to have inadequate weight gain during pregnancy as compared to prim-gravida ones (AOR = 4.82 95% CI (1.61-14.37). Underweight women during early pregnancy were 5.34 times more likely to have inadequate gestational weight gain as compared to normal early pregnancy BMI (AOR=5.34 95%CI: 3.07-9.27). Likewise, women who gave birth before 37 weeks of gestation were 4.85 times more likely to have gain inadequate weight during pregnancy than those who delivered at or beyond 37 weeks. (AOR= 4.84, 95% CI: 2.47-9.45)). Lastly, women living in severely food insecure households were 2.67 times times more likely to have inadequate gestational weight gain compared to those women from food secure households (AOR= 2.67, 95% CI: 1.36-5.21). (Table 5)

Table 5: Multivariate analysis of factors associated with gestational weight gain among pregnant women in public and private health facilities in Gar-owe Puntland Somalia, 2025

Variables	**Categories**	**GWG**		**COR(95%CI)**	**AOR(95%CI)**	**P-value**
		Inadequate N%	**Adequate N%**			
Education	College and above	64(71.11)	26(28.89)	1		1
	No formal education	95(52.49)	86(47.51)	2.22(1.29-3.82)	2.06(1.07-3.95)	**0.029**
	Primary	40(57.99)	29(42.03)	1.78(0.92-3.45) 2.32(1.20-4.48)	1.20(0.53-2.71) 1.83(0.83-4.04)	0.649
	Secondary	35(51.47)	33(48.523)			0.132
Family income	300-400	103(66.03)	53(33.97)	1	1	1
	100-200	101(66.03)	96(33.97)	1.84(1.19-2.84)	1.02(0.58-1.77)	0.937
	>500	30(54.55)	25(45.45)	0.79(0.65-5.74)	1.02(0.47-2.18)	0.957
Occupation	Private organization	27(45.00)	33(55.00)	1	1	1
	Government employee	23(37.70)	38(62.30)	1.35(0.65-2.79) 0.37(0.20-0.67)	1.38(0.56-3.39) 0.37(0.17-0.79)	0.480
	House wife	133(68.56)	61(31.44)	0.67(0.35-1.29)	0.52(0.22-1.22)	**0.011**
	Student	51(54.84)	42(45.16)			0.136
History of abortion	No	200(85.47)	140(80.46)	1		1
	Yes	34(14.53)	34(19.54)	1.42(0.84-2.40)	0.71(0.29-1.75)	0.469

Maternal complication in the previous pregnancy	No Yes	211(90.17) 23(9.83)	148(85.06) 26(14.94)	1 1.61(0.88-2.93)	1 2.41(0.87-6.65)	1 0.089
Gravidity	Prim-gravida Multigravida	47(20.09) 17(9.77)	157(90.23) 157(90.23)	1 2.32(1.28-4.20)	1 4.82(1.61-14.37)	1 **0.005**
Early pregnancy BMI	Normal and above Underweight	44(32.84) 190(69.34)	90(67.16) 84(30.66)	1 4.62(2.97-7.20)	1 5.34(3.07-9.27)	1 **0.000**
Parity	Nulliparous Primiparous Multiparous	35(66.04) 44(65.67) 155(53.82)	18(33.96) 23(34.33) 133(46.18)	1 0.84(0.41-1.72) 1.45(0.81-2.59)	1 0.34(0.100-1.17) 0.56(0.17-1.77)	1 0.087 0.325
Gestational age	≥37 weeks <37 weeks	71(78.02) 163(51.42)	20(21.98) 154(48.58)	1 3.35(1.94-5.77)	1 4.85(2.47-9.49)	1 **0.000**
HFI	Food secure Mild food insecure Moderate food insecure Severely food insecure	85(61.15) 77(64.71) 40(54.79) 32(41.56)	54(38.85) 42(35.29) 33(45.21) 45(58.44)	1 0.85(0.56-1.42) 1.29(0.73-2.30) 2.21(1.25-3.90)	1 0.73(0.39-1.34) 0.95(0.47-1.92) 2.67(1.36-5.21)	1 0.316 0.907 **0.004**

COR= Crude odd ratio AOR= Adjusted odd ratio CI= confidence interval

5. DISCUSSION

This study assessed gestational weight gain and associated factor among pregnant women in public and private health facilities in Gar-owe Puntland Somalia. In this study 57.35% (95%CI 52.4, 62.08) of pregnant women gained inadequate gestational weight. The main predictors of inadequate gestational weight gain were the factors such as education, gravidity, early pregnancy BMI, gestational age, household food insecurity were significantly associated with gestational weight gain. The findings of the study indicates high magnitude of inadequate gestational weight gain that has variation with study conducted in India 37% of whom were below the IOM range (Bhavadharini et al., 2017a).

Study conducted in Brazil was found 27.8% of pregnant women had inadequate GWG,(A. V. De Abreu Rodrigues et al., 2021a) in the Nigeria 26.9% had inadequate gestational weight gain. (Adeoye et al., 2023). In study conducted Algeria which was opposite above the studies, which was show pregnant women about 48.5% had gained less then IOM recommended. This variation might be explained that's difficult to gain adequate weight gain during pregnancies in developing countries. (Tebbani et al., 2018).

Study conducted in Addis Ababa found 67.2% of pregnancy women gained inadequate gestational weight gain. (Asefa et al., 2021) and study in Harari regional state eastern Ethiopia 69.3% had gained inadequate gestational weight gain (Asefa and Nemomsa, 2016a). The possible discrepancy could be attributed to women's inability to consume adequate food due to access and affordability issues. Pregnant women in low-income Sub-Saharan African countries face a wide range of nutritional problems due to poverty, food insecurity, and frequent infections. (Asefa et al., 2020). Also, there is a variation of pre pregnancy BMI, sociodemographic, maternal educational level that had significant association with gestational weight gain.

Adequate gestational weight gain is required for optimal pregnancy outcome. The current study found the mean weight gain during pregnancy accounted 8.22 ±1.73SD (kg/m^2)this is constant with study with the finding from a study in Pakistan(8.5kg) (Munim and Maheen, 2012) in study conducted in Indonesia show that total gestational weight gain was 8.3kg only 1 of 5 women had a total weight gained that recommend the IOM. (Winkvist et al., 2002) And in study conducted in Tigray region northern Ethiopia the mean gestational weight gain was 10.6kg they did not meet IOM guideline. (Misgina et al., 2021b)

In this study the rate of adequate gestational weight gain is 42.65 which is higher study conducted in Iran 28% of pregnant women gained adequate gestational weight gain (Yoosefi et al., 2018), also

study conducted in south Gander zone, northwest Ethiopia,65.5% gained adequate gestational weight gain which is higher in our study (Engidaw et al., 2023) the discrepancy is due to the population and nutrition habits about 90.05% consumed starch and staple foods .

According to our study women who have no formal education were 2.06 times more likely to have inadequate gestational weight gain as compared to highly education women. Similar Study done in United Arab Emirates found that women who had lower educational level were associated with inadequate gestational weight gain(Cheng et al., 2022). Study conducted in Brazil shows the higher the educational level of pregnant women lowers the risk of inadequate GWG(Aléxia Vieira De Abreu Rodrigues et al., 2021c). This might due to the mother with higher educational level during pregnancy have a great awareness of nutritional needs during pregnancy and are more likely to eat health foods. In the current study 43.93% of study participant were no formal education and this may be influence on dietary consumption during pregnancy.

In our study pregnant women who had multigravida were 4.82 times more likely to gain inadequate weight gain as compared to prim gravida. In study conducted in Tanzania that had similar with this study observed that women who had excessive GWG were more likely to be prim gravida and have higher early pregnancy BMI(Yang et al., 2022). This might be due to physiological and lifestyle changes during pregnancy

This study indicates that pregnant women with underweight body mass index at early pregnancy are 5.34 times have in adequate GWG than counterpart. In study conducted in Poland had similar with this study the risk of inadequate GWG was significantly higher in women underweight before pregnancy (Suliga et al., 2018b) but study conducted Harari region was opposite and reported that women who had higher early pregnancy BMI were more than three times more likely to gain adequate gestational weight gain as compared to the underweight group. (Asefa and Nemomsa, 2016a). This might due to lower BMI before pregnancy suggests less energy stored and a possible nutritional deficit, which raises the possibility of insufficient GWG.

This study shows that women who gave birth less than 37 weeks had 4.85 times more likely to gain inadequate gestational weight gain compared to the mothers gave birth greater than or equal 37 weeks.in study conducted in Harari region Ethiopia which is opposite in this study found that women who gave birth at or after 37 weeks of gestation were 4.5 times more likely to have gained adequate gestational weight gain to those who gave birth before 37 weeks. (Asefa and Nemomsa, 2016a). This may be attributed increased gestational age of the pregnant women there is a chance of gaining weight.

This study also shows that women who were severely food insecure had 2.66 times higher to gain inadequate weight gain compared to counterpart , this supported study published 2020 in Iran found that mothers experienced food insecurity gained about 1.5kg less during pregnancy compared to those had food secure (Kazemi et al., 2020). Lack of quality and sufficient food during pregnancy my increase gaining inadequate gestational weight gain.

5.1. Limitation of the study

Lack of temporal relationship between the independent and dependent variables due to the nature of the cross-sectional design. The study may also suffer from recall bias for some variables that involve recall based data collection. This was minimized by giving brief orientation for pregnant women during data collection period. Moreover, the study findings could not be generalized to all pregnant women in the community, as the study is institution based. Furthermore, early pregnancy BMI was taken before or at 16 weeks of gestation, at which time there may already have been an increase of gestational weight.

6 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study assessed gestational weight gain and its associated factor among pregnant women in the study area. The finding revealed a higher magnitude of inadequate gestational weight gain. Being underweight at early pregnancy and lack of adequate food was positively associated with inadequate weight gain. These results highlight the importance of addressing pre-pregnancy BMI, ensuring a balanced diet.

6.2 Recommendation

Based on the finding of this study regarding inadequate gestational weight gain the following recommendation can be made.

Health facilities

Strengthening health education about weight gain for all pregnant women who visit health care facilities by creating health education schedule at each ANC visit. The women of childbearing age should be given information about the importance of normal BMI at early pregnancy for the fetus, maintaining a balanced diet and physical activity during pregnancy by achieving health gestational weight gain.

Ministry of agriculture and food security

Food insecurity is one of the factors contributing inadequate gestational weight gain that can adversely affect both maternal and fetal health. It's important to addressing food insecurity during pregnancy, ensuring access to nutrition support program, strengthen agricultural and productivity, promoting by reducing food wastage.

Policy makers

Policy makers should be aware about the current inadequate gestational weight gain and associated factor to give better attention while making protocols and guidelines.

Researchers

Researchers should focus on study how nutrition, Income and daily habits influence healthy weight gain during pregnancy.

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8. ANNEX

8.1. Information sheet and informed voluntary consent form to be signed by heads of health facilities

Introduction:

Greeting, my name is Hafsa Farah Mire, I am the principal investigator of this study to be conducted in this Health Facilities, I am studying for my master's degree at Haramaya University in Ethiopia, the college of Health and Medical Science and I kindly request that you give me your attention so that I can explain to you about the study and why your institution was selected as the study setting.

The study title is "Assessment of Gestational Weight Gain and associated factor among pregnant women attending Antenatal care in Public and Private Health facilities in Gar-owe, Puntland, Somalia"

Purpose of the study: the finding of this study may be important for the Gar-owe city health office, individual health facilities , and health care providers ,furthermore the finding of this study will be crucial for Hospitals, the Ministry of Health (MOH) and non-governmental organization(NGOs) working in reproductive age women for panning, implementing and designing intervention and counseling to improve the practice of pregnant women and they will provide more scientific knowledge about Gestational Weight Gain among pregnant aim of this study is to write a thesis as a partial requirement for the fulfillment of a master's program for the principal investigator.

Procedure and duration: Data collectors will conduct face -to face interviews to assess the magnitude of gestational weight gain and associated factor among pregnant women using a questionnaire to provide me with pertinent data that is helpful for the study. there are some questions to answer where data collectors will fill the questionnaire by interviewing you. the interview will take 40 minutes, so I kindly request you to give me attention this time for interview**.**

Risk and benefits:

There is minimal harm that may face participant when participating in this study will take about 40 minutes of them there will not be any direct payment for participating, in this study. Moreover, the finding from this research may reveal important information for the local health planners and

implementers, aiding in the improvement of health care services and the development of targeted interventions to enhance poor gestational weight gain among mothers.

Confidentiality: all the information participants will give anonymous and confidential, only used for the purposes for this research and only accessible to me. No third parties will have access to any of the information you provide. The data will be collected, stored and disposed of in a secure manner. The information will be used in a way that will not allow you to be identified individually. **Rights:** participation in this study is fully voluntary, participant have the right to participate or not in the study, if they decide then to participate. They have the right to withdraw from the study at any time and this will not label you for any loss of benefits to which they otherwise are entitled they do not have to answer any question you do not want to answer. The public and private hospitals have also the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the date collection process in the public and private hospital's premises.

Contact address: if there any question or inquires at any time about the study or procedure, please contact principal investigator: Hafso Farah Mire, phone number +252907780900 or+2521909412192 Email xafsamire40@gmail.com

If you have any doubt about this research, you can contact the responsible Institutional Health Research Ethics Review Committee (IHRERC) at Office Phone (+251)- 0254662011 or P.O. Box 235, Harar Ethiopia

Declaration of informed voluntary consent:

I have read the participant information sheet, I have clearly understood the purpose of the study, the procedures, the risks and benefits, and issues of confidentiality, the right of participating, and the contact address for any queries, I am also informed that health facilities have the right to stop this study from being conducted if any misdeeds or unethical procedures are observed during the data collection. I have been giving opportunity to ask questions for things that may have been unclear. I also informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. The public and private hospitals have also the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the

date collection process in the public and private hospital's premises therefore, I declare May voluntary consent to participate in this study with my initial (signature) as indicated below

Name and signature of head of health facilities _____ Date _____

Name of the principal investigator _____ Date _____

8.2. Participant information sheet and informed voluntary consent for participant aged ≥18 years and above (English version)

My name is: I am working as data collector for the study being conducted by Hafsa Farah Mire who studying her master's degree at Haramaya University, College of Health and Medical Science. I kindly request you to lend me your attention to explain you about the study and institution being selected as study setting.

Title of the study "assessment of Gestational Weight Gain and associated factor among pregnant women attending Antenatal Care in Public and Private Health facilities in Gar-owe City, Puntland Somalia.

Purpose/aims of the study: the finding of this study may be important for the Gar-owe city Health office ,individual health facilities , and health care providers ,furthermore the finding of this study will be crucial for Hospitals, the Ministry of Health (MOH) and non-governmental organization(NGOs) working in reproductive age women for panning, implementing and designing intervention and counseling to improve the practice of pregnant women and they will provide more scientific knowledge about Gestational Weight Gain among pregnant. aim of this study is to write a thesis as a partial requirement for the fulfillment of a master's program for the principal investigator,

Procedure and duration: I will be interviewing you using questionnaire to provide me with pertinent data that is helpful for the study. There are questions to answer where I fill the questionnaire by interviewing you. The interview will take about 40 minutes, so I kindly request you to spare me this time for the interview.

Risks and benefits: There is a limited minimal harm that may face you when participating in this study will be taken about 40 minutes of your working time. there will not be any direct payment for participating this study. Moreover, the finding from this research may reveal important information for the local health planners and implementers.

Confidentiality: all the information participants will be given anonymous and confidential, only used for the purposes for this research and only accessible to me. No third parties will have access to any of the information you provide. The data will be collected, stored and disposed of in a secure manner. The information will be used in a way that will not allow you to be identified individually.

Rights: participation for this study is fully voluntary. you have the right to declare to participate or not in the study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which otherwise you are entitled. you do not want to answer.

Contact address: if there any question or inquires at any time about the study or procedure, please contact principal investigator: Hafso Farah Mire, cell phone: +252907780900 or+2521909412192, Email xafsamire40@gmail.com Institutional Health Research Ethics Review Committee (IHRERC) at Office Phone (+251)- 0254662011 or P.O. Box 235, Harar Ethiopia.

Declaration of informed consent

I have read/ was read to me the participant information sheet, I have clearly understood the purpose of the study, the procedures, the risks and benefits, and issues of confidentiality, the right of participating, and the contact address for any queries, I have been giving opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. therefore, I declare may voluntarily consent to participate in this study with my initial(signature) as indicated below.

Name of signature of participants _____ Date _____

Name of signature of data collectors _____ Date _____

8.3. Participant information sheet and informed voluntary consent for participant aged≥18 years (Somali version)

Hordhac: subax galab wanagsan mudane/marwo! magacaygu waa ———————— waxaan ka shaqaynayaa qaab xog aruurineed taas oo daraasaddan oo lagu fulinayo xaruntan caafimad, ama isbitaalka **Hafso Farah Mire** oo barata shahaadada masterk ee jaamacada Haramaya, kuliyada sayniska iyo caafimadka. Waxaan si naxariis leh kaaga codsanayaa inaad i amaahiso dareenkaaga si aan kaaga sharaxo daraasadda iyo in laguu xusho ka qaybgalka daraasadda.

Daraasadda: baahsanaanta miisaanka ku kordha hooyada uurka leh iyo arrimaha la xiriira Hooyooyinka uurka leh ee Garowe Puntland Somalia.

Ujeeddooyinka: ujeeddada daraasaddan ayaa ah in la ogaado baahsanaanta iyo arimaha la xiriira miisaanka ku kordha hooyada uurka leh ee u nool magaalada Garowe.daraasadaan oo muhiim u ah cusbitaalada, wasaarada caafimadka iyo ururada aan dawliga ahayn ee ka shaqeya taranka dumarka kuwaas oo qorshayana, fulinaya dawaynta iyo latalinta dumarka si ay uga hormariyan uurka iyo miisaanka saxda ah oo loo baahan yahay.

Nidaaamka iyo muddada: Waxaan ku waraysan doonaa adiga oo adeegsanaya xogwaraysi si aad noo siiso xog muhiim ah oo caawimaad u leh daraasadda. Waxaa jira suaalo laga jawaabayo oo aan foomka ku buuxin doono foomka suaalaha adiga oo ku waraysanay. Waraysiga wuxuu qaadanayaa ilaaa 40 daqiiiqo, marka waxaa si naxariis leh kaaga codsanayaa inaa ii dhaafto markan waraysiga.

Khataraha iyo faaidooyinka: khatarta ka qayb galka daraasaddan waa mid aad u yar, lkn kaliya daqiiqado ka qaadanaya waqtigaaga. Ma jiro wax lacag bixin toos ah oo loogu talagalay kaqaybgalka daraasaddan. Lakiin natiijoyinka ka soo baxay cilmi baaristan ayaa laga yaaba inay muujiyaan macluumaad muhiim u ah qorshayaasha caafimaadka deegaanka.

Qarsoodi: Macluumaadka aad nasiiso wuxuu noqon doona mid sir ah. Majiri doono macluumad kuu aqoonsan doona gaar ahaan. Natiijooyinka daraasadda ayaa guud ahaan u noqon doonta bulshada daraasadda mana ka tarjumayo wax gaar ah oo shaqsiyeed ama guriyeyn ah.

Foomka su'aalaha waxaa lagu calaamadeyn doonaa si looga reebo magacyo muujinaya. Tixraac laguma sameyn doono warbixinno afka ah ama qoraal ah oo ku xiri kara ka-qaybgalayaasha cilmibaarista.

Xuquuqda: kaqaybgalka daraasaddan waa ikhtiyaar ikhtiyaari ah. waxaad xaq uleedahay inaad ku dhawaaqdo inaad ka qaybqaadato ama aanad kujirin daraasaddan. Hadii aad go, aansato inaad ka qayb qaadato, waxaad xaq u leedahay inaad ka noqoto**.** laga soo bilaabo daraasadda waqti kasta iyo tan ayaan kugu calaamadeyn doonin luminta waxtarada oo aad si kle xaq ugu leedahay. ma aha inaad ka jawaabto suaal kasta oo aadan rabin inaad ka jawaabto.

Ciwaanka lala xiriiro: hadii ay jiraan suaalo ama wax laga waydiiyo waqti kasta oo ku saabsan daraasadda ama nidaaamka, fadlan la xiriiro adreeska soo socda**.**

Investing baaraha guud: MS Hafso Farah Mire. Taleefanka gacanta+252097780900 ama +2510909412192. Email xafsamire40@gmail.com

Guddiga Dib u-eegista Anshaxa Cilmi baarista Caafimaadka ee Hayadda (IHRERC)

Taleefanka xafiiska: 0254662011 ama PO.BOX:253, Harar, Ethiopia

Bayaanka ogolaanshaha ikhtiyaariga ah ee la wargeliyay:

Waan akhriyay/waa lay akhriyay xaashida macluumaadka ka qayb galaha.waxaan si cad u fahmay ujeedada cilmi barista, habraacyada, halista iyo faaidooyinka, arimaha sirta, xuquuqda kaqeybgalka iyo cinwaanka xiriirka wixii suaalo ah. Waxaa la isiiyay fursad aan ku waydiiyo suaalo waxyaabo aan cadayn Karin.waxaa la igu wargeliyay in isbitaalada iyo xarunta caafimad ay xaq u leeyihiin inay joojiyaan daraasadan in lasameeyo hadii wax khaladaad ah iyo hanaan anshax xumo ah lagu arkay inta lagu gudo jiro hawsha xog aruurinta ee dhismaha isbitaalada.

Magaca iyo saxiixa ka qaybgalka: _____Taariikh _____

Magaca iyo saxiixa xog aruurinta: _____ Taarikh _____

8.4. Participant information sheet and informed voluntary consent for Parents/Guardians for participant aged <18 years (English version)

Good morning/afternoon My name is ..... I am working as data collector for the study being conducted in this health center, or hospital by Hafsa Farah Mire they studying for her master's degree at Haramaya University, the College of Health and Medical Science. I kindly request you to give me your attention to explain you about the study and being selected as study participant.

Title of the study "Assessment of Gestational Weight Gain and Associated factor among Pregnant women attending Antenatal Care in Public and Private Health facilities in Gar-owe City, Puntland Somalia

Purpose of the study the finding of this study may be important for Garowe city health office ,individual health facilities , and health care providers , furthermore the finding of this study will be crucial for Hospitals, the ministry of health(MOH) and non-governmental organization(NGOs) working in reproductive age women for planning ,implementing and designing intervention and counseling to improve the practice of pregnant women and they will provide more scientific knowledge about Gestational Weight Gain among pregnant . aims of this study is to write a thesis as a partial requirement for the fulfillment of a master's program for the principal investigator.

Procedure and duration: I will be interviewing your daughter/ wife using a questionnaire to provide me with a pertinent data that is helpful for the study. There are questions to answer where I will fill the questionnaire by interviewing your daughter/wife. The interview will take about 40 minutes, so I kindly request you to spare me this time for the interview.

Risks and benefits: the risk of being participating in this study is minimal, but only taking few minutes from your daughter/wife time. there will not be any direct payment for participating in

this study. But the finding from this research may reveal important information for the local health planners.

Confidentiality: the information your daughter/wife will provide me will be confidential. there will be no information that will identify her in particular. the finding of the study will be general for the study community and will not reflect anything particular of individual persons or housing.

The questionnaire will be coded to exclude showing names. No references will be made in oral or written reports that could link participants to the research.

Rights: participation for this study is fully voluntary, your daughter/wife has the right to declare to participate or not in this study. If she decides to participate has the right to withdraw from the study at any time and this will not label her for any loss of benefits which she otherwise is entitled. She. does not have to answer any question that she does not want to answer.

Contact address: if there any question or inquires at any time about the study or procedure, please contact principal investigator: Hafso Farah Mire, cell phone: +252907780900 or+2521909412192, Email xafsamire40@gmail.com Institutional Health Research Ethics Review Committee (IHRERC) at Office Phone (+251)- 0254662011 or P.O. Box 235, Harar Ethiopia.

Declaration of informed voluntary consent

I have read /read to me the participant information sheet, I have clearly understood the purpose of the study, the procedures, the risks and benefits, and issues of confidentiality, the right of participating, and the contact address for any queries, I have been giving opportunity to ask questions for things that may have been unclear. I was informed that my daughter/wife have the right to withdraw from the study at any time or not to answer any question that she does not want. therefore, I declare may voluntarily consent to participate in this study with my initial(signature) as indicated below**.**

Name and signature of Parents/Guardian _____Date _____

Name and signature of Data collector _____Date _____

8.5. Participant information sheet and informed voluntary consent for participant aged ≤18 years (Somali version)

Hardhack: subax galab wingspan mundane/marrow! magacaygu waa waxaan ka shaqaynayaa qaab xog aruurineed taas oo daraasaddan oo lagu fulinayo xaruntan caafimad, ama isbitaalka **Hafso Farah Mire** oo barata shahaadada masterk ee jaamacada Haramaya, kuliyada sayniska iyo caafimadka. Waxaan si naxariis leh kaaga codsanayaa inaad i amaahiso dareenkaaga si aan kaaga sharaxo daraasadda iyo in laguu xusho ka qaybgalka daraasadda.

Daraasadda: baahsanaanta miisaanka ku kordha hooyada uurka leh iyo arrimaha la xiriira Hooyooyinka uurka leh ee Gar-owe Puntland Somalia.

Ujeeddooyinka: ujeeddada daraasaddan ayaa ah in la ogaado baahsanaanta iyo arimaha la xiriira miisaanka ku kordha hooyada uurka leh ee u nool magaalada Garowe.daraasadaan oo muhiim u ah cusbitaalada, wasaarada caafimadka iyo ururada aan dawliga ahayn ee ka shaqeya taranka dumarka kuwaas oo qorshayana, fulinaya dawaynta iyo latalinta dumarka si ay uga hormariyan uurka iyo miisaanka saxda ah oo loo baahan yahay.

Nidaaamka iyo muddada: Waxaan waraysan doonagabadhada/xaaskaaga, aniga oo adeegsanaya xogwaraysi si aad noo siiso xog muhiim ah oo caawimaad u leh daraasadda. Waxaa jira suaalo laga jawaabayo oo aan foomka ku buuxin doono foomka suaalaha adiga oo ku waraysanay. Waraysiga

wuxuu qaadanayaa ilaaa 40 daqiiiqo, marka waxaa si naxariis leh kaaga codsanayaa inaa ii dhaafto markan waraysiga.

Khataraha iyo faaidooyinka: khatarta ka qayb galka daraasaddan waa mid aad u yar, lkn kaliya daqiiqado ka qaadanaya waqtiga gabadhaada/xaaskaga. Ma jiro wax lacag bixin toos ah oo loogu talagalay kaqaybgalka daraasaddan. Lakiin natiijoyinka ka soo baxay cilmi baaristan ayaa laga yaaba inay muujiyaan macluumaad muhiim u ah qorshayaasha caafimaadka deegaanka.

Qarsoodi: Macluumaadka ay nasiiso gabadhaada/xaaskaaga nasiiso wuxuu noqon doona mid sir ah. Majiri doono macluumad u aqoonsan doona gaar ahaan. Natiijooyinka daraasadda ayaa guud ahaan u noqon doonta bulshada daraasadda mana ka tarjumayo wax gaar ah oo shaqsiyeed ama guriyeyn ah.
Foomka su'aalaha waxaa lagu calaamadeyn doonaa si looga reebo magacyo muujinaya. Tixraac laguma sameyn doono warbixinno afka ah ama qoraal ah oo ku xiri kara ka-qaybgalayaasha cilmibaarista.

Xuquuqda: kaqaybgalka daraasaddan waa ikhtiyaar ikhtiyaari ah. Waxay xaq uleedahay inay gabadhaada/xaaskaaga ku dhawaaqdo inayka qaybqaadato ama aanad kujirin daraasaddan. Hadii ay go'aansato inay ka qayb qaadato, waxay xaq u leedahay inay ka noqoto**.** Laga soo bilaabo daraasadda waqti kasta iyo tan ayaan kugu calaamadeyn doonin luminta waxtarada oo aad si kle xaq ugu leedahay. ma aha inaad ka jawaabto suaal kasta oo aadan rabin inaad ka jawaabto.

Ciwaanka lala xiriiro: hadii ay jiraan suaalo ama wax laga waydiiyo waqti kasta oo ku saabsan daraasadda ama nidaaamka, fadlan la xiriiro adreeska soo socda**.**

Investing baaraha guud: MS Hafso Farah Mire. Taleefanka gacanta+252097780900 ama +2510909412192. Email xafsamire40@gmail.com

Guddiga Dib u-eegista Anshaxa Cilmi baarista Caafimaadka ee Hayadda (IHRERC)

Taleefanka xafiiska :0254662011 ama PO.BOX:253, Harar, Ethiopia

Bayaanka ogolaanshaha ikhtiyaariga ah ee la wargeliyay:

Waan akhriyay/waa lay akhriyay xaashida macluumaadka ka qaybgalaha. waxaan si cad u fahmay ujeedada cilmi barista, habraacyada, halista iyo faaidooyinka, arimaha sirta, xuquuqda kaqeybgalka iyo cinwaanka xiriirka wixii suaalo ah. Waxaa la isiiyay fursad aan ku waydiiyo suaalo waxyaabo aan cadayn Karin.waxaa la igu wargeliyay in isbitaalada iyo xarunta caafimad ay xaq u leeyihiin inay joojiyaan daraasadan in lasameeyo hadii wax khaladaad ah iyo hanaan anshax xumo ah lagu arkay inta lagu gudo jiro hawsha xog aruurinta ee dhismaha isbitaalada.

Magaca iyo saxiixa ka qaybgalka: _____Taariikh _____

Magaca iyo saxiixa xog aruurinta: _____ Taarikh _____

8.6 Questionnaire (Data collection tool)

Part I question in sociodemographic factor			
Code	Variable	Response	Skip
101	How old are you?	_____In years	
102	What is your current marital status?	1.Single 2.Married 3.Divorsed 4.Separated	
105	What is your place of residence?	1. Rural 2. Urban	
106	What is your occupation?	1. Student 2. House wife 3. Private organization employee 5.Government employee	

107	What is your educational level?	1.Non formal education 2.Primary 3.Secondary 4.College and above	

Part II question concerning past pregnancy and obstetric history			
Code	Variable	Response	Skip
201	Number of pregnancy (Gravidity)	_____	
202	Number of delivery(parity)		
203	Number of children a live?		
204	Any abortion in your lifetime?	1. Yes 2. No	If Q204no,go to Q207
205	Number of abortion		
206	Type of abortion	1. Induced 2. Spontaneous	

207	Have you had any obstetrics maternal complication in the previous pregnancy or delivery?	1. Yes 2.No	IfQ207 no go to Q209
208	What was the complication you have(the mother faced)	1. APH 2. PPH 3. Sepsis 4.Obstructed labor 5.Eclampsia/preeclampsia 6.Abortion 7. Other (specify)	
209	Have you had any neonatal complication during the previous pregnancy or delivery?	1. Yes 2.No	If Q209no Go to Q 211
210	What was the neonatal complication your child has faced?	1. Neonatal sepsis 2. Neonatal jaundice 3. Low birth weight 4. Still birth 5.Preterm 6.Birth defect 7.Breathing problem 8.Other (specify)	
211	Have you had any known chronic medical disorder?	1.Yes 2.No	

212	If yes to 211, what type of disease?	1. Hypertension 2. Diabetes 3. Cardio vascular disease 4. other specify	

Part III Question concerning current/recent pregnancy			
Code	Variable	Response	Skip
302	Does the current pregnancy base on your interest?	1. Yes 2. No	
303	Spacing between past and recent pregnancy in months?	_____Months	
304	When was your first ANC visit in weeks?	_____ Weeks	
305	Duration of the current pregnancy in weeks?	_____ Weeks	
306	Have you faced any major obstetric problem in the current pregnancy?	1. Yes 2. No	If Q306 no go to Q308
307	Please specify the major obstetric problem you have encountered?	1. APH 2. Eclampsia 3. Hyperemesis gravid 4. Other specify	

308	Any medical disorder in the current pregnancy?	1.Yes 2.No	If yes to Q308
309	What is the medical disorder in the current pregnancy?	Diabetes mellitus Hypertension CVD Other (specify)	

Part IV question concerning Household food security status			
Code	Variable	Response	Skip
401	In the past four weeks did you worry that your household would not have enough food?	1. Yes 2.No	If no ,go to Q 402
401a	How often did this happen?	1. Rarely 2. Sometimes 3.Often	

402	In the past four weeks, were you or any household member not able to eat the kind of foods you preferred because of a lack of resources?	1. Yes 2.No	If no,go to Q403
402a	How often did this happen?	1. Rarely 2. Sometimes 3.Often	
403	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resource to obtain other type of food?	1. Yes 2.No	If no, go to Q 404
403a	How often did this happen?	1. Rarely 2. Sometimes	
		3.Often	
404	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1.Yes 2.No	If no, go to Q405

404a	How often did this happen?	1. Rarely 2. Sometimes 3.Often	
405	In the past four weeks, did you or any other household member have to eat a smaller meal than you felt you needed because there was not enough food?	Yes No	If no, go to Q406
405a	How often did this happen?	1. Rarely 2.Sometimes 3.Often	
406	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resource to get food?	1. Yes 2.No	If no, go to Q407
406a	How often did this happen?	1. Rarely 2. Sometimes 3.Often	
407	In the past four weeks,did you or any other household member have to eat fewer meals in a day because there was not enough food?	1. Yes 2.No	
407a	How often did this happen?	1. Rarely 2.Sometimes 3.Often	

408	In the past four weeks, did you or any household member have to eat a limited variety of food due to lack of resource?	1.Yes 2.No	
408a	How often did this happen?	1.Rarely 2.Sometimes 3.Often\	
409	In the past four weeks, did you or any other household member go a whole day and night without eating anything because there was not enough food?	1.Yes 2.No	
409a	How often did this happen?	Rarely Sometimes Often	

Dietary diversity

Now I will like to ask you about foods& drinks that you consumed yesterday during the day or night, whether you ate or drank it at home or somewhere else .please think about snacks and small meals as well mean meals.

Yesterday during the day and night did you eat

Part VI question concerning dietary diversity

601	Anjera, porridge, bread, rice, pasta, biscuit or any food made from cereals and grains?	1.Yes 2.No	
602	, potato sweet potatos, or any food made from tubers?	1.Yes 2.No	
603	Food made from beans, peas, lentils or other pulses?	1.Yes 2.No	
604	Food made from groundnut/peanut or certain seeds, or nut/seeds butter, ice cream or sour cream?	Yes No	
605	Milk, cheese ,yoghurt or other milk products but not including butter, ice cream, cream or sour cream?	1.Yes 2.No	
606	Liver, kidney or other organ meat?	1.Yes 2.No	
607	Beef,lumb,goat,chicken or other meat/poultry	1.Yes 2.No	
608	Fresh or died fish	1.Yes 2.No	
609	Eggs ?	1.Yes 2.No	
610	Any medium to dark green leafy vegetables such as spinach and lettuce?	1.Yes 2.No	
611	Pumpkin, carrots ,squash or sweet potato that are yellow or orange inside	1.Yes 2.No	
612	Fruits such as ripe papaya or mango?	1.Yes 2.No	
613	Other vegetables?	1.Yes 2.No	

615	Other fruits?	1.Yes 2.No	

Part VIIII check list for secondary data/client card			
Codes	Variable	Response	Skip
701	Number of antenatal care visits		
702	Maternal weight at first visit in Kg	Kg	
703	Maternal weight second visit		
704	Maternal weight at third visit	Kg	
705	Maternal height in cm	Cm	
706	Maternal MUAC in cm	Cm	

8.7. Data collection tool Somali version

Suaalo waydiin lagu qiimaynayo baahsanaanta miisaanka ku kordha hooyada uurka leh iyo arimaha la xiriirka hooyoyinka uurka leh kuwaas oo tagaya xarumaha caafimadka guud ee Garowe Puntland Somalia.

Su'aalo waydiimaha ID.no _____ cinwaan

Magaca xarunta caafimaadka _____ Taarikhda _____ waraysiga

Waqtigu wuu bilaaabmay _____ waqtigii _____ dhamaaday

Koodhka ka qaybgalka _____

Qaybta koobaaad: xaaladda dhaqan dhaqaale			
Qno	**Suaalo**	**Jawaab celin**	**Kabood**
101	Imisa jir ayaad tahay?	_____ Sanad ahaan	
102	Waa side xaalad guurka?	1. Guur doon 2. La guursaday 3. La furay 4. Iska daayay	
105	Halkee ayaad ku nooshahay?	1. Magaalo 2. Miyi	
106	Maxay taha shaqadaadu?	1. Arday 2. Xaas 4. Shaqaale maalinle 5. Shaqaale xarun gaar ah 6. Shaqaale dawladeed	
107	Heerkaaga aqooned?	1. Waxbarasho dadban 2. Dugsi Hoose 3. Dugsi Sare 4:.Machad iyo waxii kasareeya	
108	Dhaqaale intee leeg ayaa kusoo gala bishii dollar ahaan?	_____ USA Dollar	

Qaybta labaad:suaalaha la xiriirka uurarkii hore iyo caqabad kala kulantay foosha			
QNo	Suaalo	Jawaab celin	Kobaad

201	Intee jeer uur qaaday?		
202	Imisa ayaad dhashay?	_____	
203	Imisa caruur ku nool?	_____	
204	Noloshaada ilmo makaa dilmeen?	1. Haa 2. Maya	Haday tahay maya aad suasha 7aad
205	Imisa ayaa kaa dilmey?	_____	
206	Nooca dilanka?	Soo jiidan Ilma iska soo ridid	
207	Wax caqabad ah Makala kulantay	1. Haa 2. Maya	Haday maya tahay ugudub Q209

	Uurarkii hore ama dhalmadiiba?		
208	Maxay tahay caqabada aad la kulantay?	1. Dhiig furan 2. Dhiig bax umusha 3. kadib 4. Dheecaan 5. Fool xanuun 6. Qalal 7. Dhikarka uurka 8. Midkle (caday)	
209	Ma jirtaa caqabad ilmaha so wajahday?	1. Haa 2. Maya	Haday maya tatay ugudub suasha 211

210	Maxay tahay caqabadaas aad la kulantay?	Caabuqa ilmaha Indacaseye ilmaha Miisan hooseeya Ka hor dhashay Cillad dhalasho Cillad neeftsasho Midkle (cadeey)	
211	Maleedahay xanuunada dabadheraada?	1.Haa 2.Maya	
Qaybta sadexaad:			
QNO	Suaasha	Jawaabta	kabood
301	Uurka ma hadda qorshaysay?	Haa maya	
302	Ma adiga ayaa xiisaynayay uurkaaga hadda?		
303	Imisa bilood u dhaxaysay uurkaaga hada iyo kuwii hore?		
304	Goorme ahayd markii kugu horeysay xarun caafimad booqato asbuuc ahaan?		
305	Waa imisa asbuuc uurkaaga hada	———— asbuuc	
306	Wax caqabad ama xanuun ah Makala kulantay uurkaagan?	Haa Maya	

307	Adoo mahadsan waa noocma xanuunka iyo caqabada aa la kulantay?	Dhiig bax Qalal Hunqaaco daran Midkle(cadeey)	
308	Ma jirtaa xanuun aa qabto xiliga uurkan	Haa Maya	
309	Maxaa waaye nooca xanuunkaga?	Sonkor Dhiikar Wadna xanuun Midkle (cadeey)	

Qaybta afaraad :Heerka helitaaanka cunada guriga			
401	Afatrii asbuuc lasoo dhaafay maka walwashay inaadan cuno kugu filan helayn?	Haa Maya	Hadii maya tahay ugudub suasha 402

401a	Imisa goor ayay dhacdaa?	1. Inyar 2. Mararka qaar 3.Badanaa	
402	Afatii asbuuc lasoo dhaafay afi ama qof guriga kamid ah ma awoodi waayay inuu cuno cunada uu rabay awood dhaqaale darted?	1. Haa 2.Maya	
402a	Imisa ayay dhacdaaa	1. Inyar 2. Mararka qaar 3.badanaaa	

403	Afartii asbuuc lasoo dhaafay .adiga ama qof kamid ah familka ma canteen cuna Aydan rabin sabab dhaqaale awgeed?	Haa Maya	
403a	Imisa goor ayay dhacdaaa	Inyar Marraka qaar badanaa	
404	Afartii asbuuc lasoo dhaafay adiga ama qof guriga kamid ah ma seexday asaga oo waxba cunin cuno ku filan la,aan darted?	Haa Maya	
404a	Imisa goor ayay dhacday?	Inyar Mararka qaar Badanaa	

405	Afartii asbuuc lasoo dhaafay.adiga ama qof guriga kamid ah ma cunay cuno aad uga yar intii uu ubaahna .cuno ku filan oo oolin darted?	Haa Maya	
405a	Imisa goor ayay dhacday?	Inyar Mararka qaar badanaa	

406	Afartii asbuuc lasoo dhaafay. Maa dhacday inaan cunaba guriiga ooolin noockasta sabab dhaqaale la,aan darted?	Haa Maya	
406a	Imisa goor ayay dhacday?	Inyar Mararka qaar badanaa	
Qaybta shanaad:dabeecadaha iyo dhaqanka			
501	Waligaa sigaar ma cabtay ama tobacco ma cuntay?	Haa Maya	Maya hadii tahay aad suasha 203
502	Hadda wax sigaar ah ma cabtaa ama tobacco?	Haa Maya	
503	Waligaa qaad ma cuntay?	Haa Maya	
504	Hadda qaad ma cuntaa?	Haa Maya	
505	Imisa jeer ayaad isticmaasha qaadka maaalinkii?	———	

Cunooyinka inta badan cunto

Waxaan doonaya inaa ku waydiiyo cunnoyinki iyo cabitankii aa shalay cuntay iyo xalay,ama ka cun guriga ama banaanka maqaaxi.waxaan kaaa codsan inaa sidoo kle ishegto cunnooyinka yaryar iyo kuwa waa waynba.

Qaybta lixaad:suaala khoseeya cunada inta badan cunto			
601	Canjeela,borash,rooti,bariis,baasto?	Haa Maya	
602	Caroto,squas ama baradho macaan?	Haa Maya	

603	Caano?	Haa Maya	
604	Jeese ama caaao garoor?	Haa Maya	
605	Beer ,kiliyo, ama wadne?	Haa Maya	
606	Hilib lo,riyo ama geel?	Haa Maya	
607	Kaluun ama cunooyinka badda?	Haa Maya	
608	Ukun?	Haa Maya	
609	Canbe ama babay	Haa Maya	
610	Tufaax,avocado,moos,qudaar,cananans ama canuuni		
Shalay suabxdii ama habeenki ma cuntay ama ma cabtay			
611	Baradho shiilan,digaag shilan ama kaluun shiilan	Haa Maya	
612	Baasta induumi	Haa Maya	
613	Bur shiilan ama sanbuusa	Haa Maya	
614	Maqaaaxiyaha cunada fudud cuno laga keenay?	Haa Maya	
615	Shukulaato,nacnac, buskut,doolshe ama ice cream.	Haa Maya	

Qaybta todobaad: xogta labaad ee bukaanka kaarkiisa			
701	Imisa jeer hooyada iyo dhalaanka soo booqatay?		
702	Miisaanka hooyada markii u horeysay ay timid hospitalka?	——— Kg	

703	Miisanka hooyada booqashada 2aad	_____ Kg	
704	Miisaanka hooyada booqashada 3aad?	Kg _____	
705	Dherarka hooyada Cm ahaan?	_____ Kg	
706	MUAC hooyada Cm ahaan?	Cm	
707	Imisa ilmo dhashay?		
708	Da,da hooyada ?		

8.8. Curriculum vitae of principal investigator

1) PERSONAL INFORMATION

Name:- Hafsa Farah Mire

Date of birth:- 01 Aug 1998

Place of birth:-Gardo ,Puntland, Somalia

Sex :- Female

Marital status:-single

Nationality:- Somali

Residence: Gardo, Puntland, Somalia

Address Tel:-Somalia +252907780900 Ethiopian+2521909412192 e-mail:-

xafsamire40@gmail.com

2) EDUCATIONAL BACKGROUND

Program	**School/institution attended**	**Grade**	**Years of study**
Elementary	Al-imam Al-nawawi	1	2007
Elementary	Al-imam Al-nawawi	2-4	2008-2010
Primary	Al-imam Al-nawawi	5-8	2011-2013

Secondary	Al-imam Al-nawawi	9-12	2014-2017
Diploma program	University Of Health Science	1 year	Candidate
Degree program	University Of Health Science	3years	2018-2021
Master Degree	Haramaya University	2 years	Candidate

3) QUALIFICATION

- Bachelor of food science and nutrition
- Diploma of research and biostatics
- Candidate of MPH in public health nutrition

4) WORK EXPERIENCE

- **2 year of experience of nutrition in isniino health center in bosaaso.**

5) SKILLS

- Computer skills
- Instructing /Teaching skill

6) LANGUAGE SKILLS

Languages	**Writing**	**Reading**	**Listening**	**Speaking**
Somali	Excellent	Excellent	Excellent	Excellent

English	Excellent	Very Good	Excellent	Very Good
Arabic	Excellent	Excellent	Excellent	Excellent

7) HOBBIES

- ✓ Reading different books
- ✓ Watching television&movies
- ✓ Listening Quran
- ✓ Doing in a team and independently

10) REFERENCE

Name :- Najma Abdirizak Hussein Head the university of Health science Bossaso

Email:- **Najmaabdiririzak@gmail.com**

Address:-Bossaso Puntland Somalia **Contact number:-** +252907791581

8.9. APPROVAL SHEET

HARAMAYA UNIVERSITY

POST GRADUATE PROGRAM DIRECTORATE

Gestational Weight Gain and Associated Factor Among Pregnant Women Attending Antenatal care in Public and Private Health Facilities in Garowe, Puntland, Somalia

Submitted by:

_____ _____ _____

Name of Student Signature Date

Approved by:

1. _____ _____ _____

Name of Major Advisor Signature Date

2. _____ _____ _____

Name of Co-Advisors Signature Date

3._____ _____ _____

Name of research thematic area leader signature Date

4. _____ _____ _____

Name of Chairman, DGC Signature Date

5. _____ _____ _____

Name of Dean PGPD Signature Date