

Research Article

# Magnitude and Associated Factors of Gestational Excessive Weight Gain Among Pregnancy Women at St Paul's Hospital, Addis Ababa, Ethiopia 2024, a Crosse-Sectional Study

Megbar Yilie Alemu\* 

Department of Obstetrics and Genecology, St Paul Hospital Millennium Medical College, Addis Ababa, Ethiopia

## Abstract

**Background:** Women invariably gain weight during pregnancy due to fat deposition, fluid retention, and the weight attributed to the growth of the fetus, uterus, and breasts. Gestational weight gain can influence pregnancy outcomes as well as the long-term health of both the mother and child. It is reported that nearly 50 percent of mothers worldwide experience excessive weight gain during pregnancy. Suboptimal weight gain during pregnancy is also a recognized risk factor for adverse delivery outcomes. **Objective:** To assess the magnitude of excess maternal gestational weight gain and the associated factors influencing pregnancy complications among pregnant women at St. Paul's Hospital, Addis Ababa, Ethiopia, in 2024. **Methods and Materials:** An institutional-based descriptive cross-sectional quantitative approach was used to conduct the study. Data were collected using both primary and secondary sources. Well-organized interviewer-administered questionnaires and a checklist were utilized. The sample size was determined using a single population formula Considering the proportion to be 50% to get the maximum possible sample size. A total of 422 mothers participated in the study, and a systematic random sampling technique was employed to select the study population. Data were collected, summarized, tabulated, and analyzed using the Statistical Package Epi-Info version 7 and SPSS version 26 software. Frequencies, proportions, and dispersions were estimated to describe the variables. Multivariate analysis was used to determine the association between explanatory variables and gestational weight gain. **Results:** A total of 422 pregnant mothers participated in the study, resulting in a 100% response rate. The majority, 201 (47.6%), were in the age group of 20 to 25 years, and 179 (42.4%) had delivered two children. Additionally, 112 (26.5%) ate more than four times per day, and 303 (71.8%) consumed carbohydrates daily. Of the participants, 375 (88.9%) gained adequate weight, 35 (8.3%) gained excessive weight, and 12 (2.8%) gained inadequate weight during their current pregnancy. Being employed and consuming fruits and vegetables were associated with a lower likelihood of excessive gestational weight gain, while high carbohydrate consumption was linked to a higher risk of excessive weight gain. **Conclusion and Recommendation:** A significant proportion of women (35%) gained excessive weight. Unemployment and daily carbohydrate and fruits consumption were significantly associated with excessive weight gain. Women of childbearing age should be informed about the importance of consuming fruits and vegetables and reducing carbohydrate intake during pregnancy to prevent excessive weight gain.

## Keywords

Magnitude, Weight Gain Adequacy, Pre-pregnancy BMI, Pregnant Women, Ethiopia

\*Corresponding author: [megbar.yilie@sphmmc.edu.et](mailto:megbar.yilie@sphmmc.edu.et) (Megbar Yilie Alemu)

**Received:** 18 August 2024; **Accepted:** 6 September 2024; **Published:** 26 September 2024



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## 1. Introduction

Women invariably gain weight during pregnancy due to fat deposition, fluid retention, and the weight of the growing fetus, uterus, and breasts. Gestational weight gain can influence both pregnancy outcomes and the long-term health of the mother and child. Excessive weight gain is well known to increase the risk of fetal overgrowth [1]. It is reported that nearly 50 percent of mothers worldwide experience excessive weight gain during pregnancy [2].

Recent studies have shown that pre-pregnancy weight is associated with the infant's birth weight [3, 4]. This, in turn, affects neonatal outcomes such as perinatal mortality, macrosomia, and congenital anomalies [5, 6]. Additionally, maternal obesity leads to higher cesarean section rates and increased anesthesia risks. The long-term impact of maternal obesity includes postpartum weight retention and an exacerbation of obesity [7].

Cesarean sections and fetal overgrowth are also major concerns among obese women [8]. In Denmark, the percentage of infants with macrosomia increased from 16.7% to 20.9% over a period of 10 years, with increasing maternal BMI being a significant factor [9]. Several other studies have also shown associations between excessive gestational weight gain, cesarean delivery, and macrosomia [10].

Nonetheless, data on excessive gestational weight gain and its determinants are scarce in developing countries, partly due to difficulties in collecting information throughout the pregnancy period. Therefore, this study aims to assess weight gain during pregnancy and its associated factors.

## 2. Materials and Method

### 2.1. Study Area and Period

The study was conducted at St. Paul's Hospital, located in Addis Ababa, the capital of Ethiopia, in the Gulele sub-city. The hospital offers a full range of comprehensive health services, including medical, surgical, pediatric, obstetric, gynecological, and basic emergency services. It also has diagnostic departments such as laboratories, imaging centers, and ECG.

The Obstetrics and Gynecology department includes maternal and child health/family planning, a gynecology ward, and a maternity unit. The maternity unit consists of a labor ward, an operating theater, antenatal and postnatal wards, and a newborn unit. This unit is managed by obstetricians/gynecologists, medical doctors, medical officers, midwives, and nurses. The site was chosen due to the large number of women seen at this facility.

The hospital also has a well-equipped operating room, managed by general surgeons, obstetricians/gynecologists, anesthetists/anesthesiologists, and operating theater nurses. On average, the hospital handles 100 women for antenatal

care (ANC) follow-up per day and 20 pregnant women delivering in the hospital each day.

### 2.2. Study Period

The study was conducted from March, 1, 2024 to April, 1, 2024 on women attending the facility.

### 2.3. Study Design

An institution-based descriptive cross-sectional study design that employs quantitative data collection was used.

### 2.4. Source Population

All pregnant women attend their health care service at different hospitals in Addis Ababa, Ethiopia.

### 2.5. Study Population

The study population was all sampled pregnant women attending their pregnancy follow-up and delivery at St. Paul's hospital and who fulfilled inclusion criteria.

### 2.6. Sampling Procedure

#### 2.6.1. Sample Size Determination

The sample size will be calculated using a single population proportion formula. Considering the proportion to be 50% to get the maximum possible sample size:

$P = 0.5$ ,  $q = 0.5$ , 5% of the marginal error,  $Z =$  standard normal distribution value at 95% of confidence level of  $Z_{\alpha/2} = 1.96$ .

Where

$n =$  sample size

$P = 50\%$

$d =$  margin of error 5%.

$Z_{\alpha/2}$  = the standard normal deviation of 1.96% confidence interval (CI)

So,

$$n = \frac{(Z_{\alpha/2})^2 P(P-1)}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2}$$

$$n = 384.16, = 384$$

Therefore, 384 people will be included in the study. Adding 10% non-response rate, the final sample size is 422.

### 2.6.2. Sampling Technique

A convenient data collection technique was applied to select the study participants visiting St Paul's Hospital antenatal clinic. From the situational analysis of the registry book, there are about 15 ANC visits per day. During the 1-month data collection period, we included all 450 ANC attending clients.

### 2.6.3. Operational Definitions

Level of excessive gestational weight gain: the amount of weight gains between conception and just before the birth of the infant was divided into three gestational weight gain categories; <8 kg (low weight gain), 8 kg–15.9 kg (normal weight gain), and 16+ kg (high weight gain). Gestational weight gain was described as the difference between the maternal body weights recorded when the woman attended the delivery room and the one measured during the first visit to the outpatient clinic.

### 2.6.4. Data Collection Method, Tool, and Procedures

Data were collected using both primary and secondary methods through interviews and checklists. Secondary data, such as initial maternal weight, gestational age, number of ANC visits, and parity, were extracted from antenatal follow-up registration cards. Weight was measured using a digital scale. A well-structured, pre-tested questionnaire was used for interviewing respondents. The questionnaire was prepared in English, translated into Amharic, and then retranslated back to English to ensure consistency. Checklists were used to collect information on weight, mid-upper arm circumference (MUAC), blood pressure, and laboratory results. Five nurses from the hospital were recruited for data collection, and the principal investigators supervised the process.

### 2.6.5. Data Quality Control

The Pre-test was conducted on 5 mothers who were not included in the main study to ensure common understandability of the questionnaires by all respondents.

### 2.6.6. Data Processing and Analysis

The data was collected, summarized, tabulated and analyzed using Statistical Package Epi -Info version 7 and SPSS version 26 software. Frequencies, proportions, and dispersions were estimated to describe the variables. Bivariate and multivariate analyses were used to determine the association between the explanatory variables and gestational weight gain. A p value of < 0.05 was considered as statistically significant association.

## 3. Result

### 3.1. Socio-Demographic Characteristics

A total of 422 pregnant mothers participated in this study

making a response rate of 100% the majority of them 201 (47.6%) were found between the age group of 20 and -25. All of them 100% were married. Regarding their religion 301 (71.3%) was Christian. Concerning their education majority 280 (66.4%) was unemployed. Concerning education 398 (94.3%) was literate (table 1).

**Table 1.** Socio-demographic characteristics of the respondents in St. Paul's Hospital Addis Ababa Ethiopia, 2024.

Variable	Frequency	Percent
age group	20-25	201
	26-30	105
	31-35	91
	36-40	25
Occupation	Unemployed	280
	Employed	142
Marital status	Single	0
	Married	422
Religion	Muslim	121
	Christian	301
Educational status	No formal education	24
	Literate	398
Family size	Less than three family	399
	greater than three family	23
Income/Birr	less than 5000 birr	200
	Greater than 5000 birr	222

### 3.2. Obstetric History of Respondents

According to respondents age at menarche majority of them 145 (34.4%) of them started their menstruation before the age of 12 while 100 (23.7%), 75 (17.8%), 85 (20.1%) of them started at age of 13, 14, and 15 years of age respectively. Regarding their parity majority of them 179 (42.4%) delivered two children while 125 (29.6%) delivered one, 43 (10.1%) delivered three and 25 (5.9%) four and more children. (Table 2)

**Table 2.** Obstetric history of respondents in St. Paul's Hospital Addis Ababa Ethiopia, 2024.

Variable	Frequency	percent
Age at menarche	<12 years	145
	13 years	100

Variable	Frequency	percent
14 years	75	17.8
15 years	85	20.1
16 years	17	4.0
0	50	11.8
1	125	29.6
2	179	42.4
3	43	10.1
Four and more	25	5.9

### 3.3. Nutritional and Exercise History of the Respondents

Three hundred sixty-nine (87.4%) of them did exercise at least once per week while 53 (12.6%) were not engaged in any physical exercise during the current pregnancy, 280 (66.4%) of them ate four times per day, and 112 (26.5%) of them ate more than four times per day only 30 (7.1%) ate two to three times per day during their current pregnancy. Three hundred ninety-two (92.9%) of them consumed fruits and vegetables every day, only 30 (7.1%) consumed fat daily, 303 (71.8%) of them consumed carbohydrates daily (table 3).

**Table 3.** Nutritional and exercise history of respondents in St. Paul's hospital Addis Ababa Ethiopia, 2024.

Variable		Frequency	Percent
Physical	Yes	369	87.4

Variable		Frequency	Percent
exercise at least once per weak	No	53	12.6
Frequency of eating	2-3 times	30	7.1
	four times	280	66.4
	more than four	112	26.5
Frequency of eating fruits & vegetable	Every day	394	93.4
	Once up to three times per week	28	6.6
Frequency of eating fat	Every day	30	7.1
	Once or three times per week	392	92.9
Frequency of eating carbohydrates	Every day	303	71.8
	Once or three times per week	119	28.2

### 3.4. Weight, MUAC, Blood Pressure, and Blood Sugar Status of the Respondents

The majority of the respondents are found at a gestational age of 40 weeks (Table 4). Three hundred seventy-five (88.9%) gained weight 8-16 kg, 35 (8.3%) gained more than 16 kg and 12 (2.8%) of them gained less than 8kg (Table 4). Regarding their measurement of MUAC the majority of them, 294 (69.7%) range between 18.5 and -24.9 while 93 (22.0%) of them range between 25-29.9, and only 35 (8.3%) of them were <18.16 concerning their blood pressure status only 34 (8.0%) have high blood pressure and 317 (75.1%) of them their current blood sugar ranges between 90-100 mg/dl. (Table 4)

**Table 4.** Weight, MUAC, blood pressure, and blood sugar status of the respondents in St. Paul's Hospital Addis Ababa Ethiopia, 2024.

Variable		frequency	Percent
current MUAC	<18.5	35	8.3
	18.5-24.9	294	69.7
	25-29.9	93	22.0
current blood pressure	<120/80	186	44.0
	120/80 mm Hg	111	26.3
	120-140/80-90 mm Hg	38	9.0
	140/100 mm Hg	87	20.6
current fasting blood sugar level	<90 mg dl	34	8.0
	90-100 mg dl	317	75.1
	100-120 mg dl	47	11.1
	>140 mg dl	24	5.7

Variable		frequency	Percent
weight gain/kg	8-16 kg adequate weight gain	375	88.9
	<8kg inadequate weight gain	12	2.8
	>16 kg excessive weight gain	35	8.3

### 3.5. Factors Associated with Excess Gestational Weight Gain

**Table 5.** Bivariable and multivariable association of gestational excessive weight gain and independent factors among pregnancy women at St Paul's hospital, Addis Ababa, Ethiopia 2024.

Variable	Category	Excessive wt. gain		COR, 95%CI	AOR, 95%CI
		Yes	No		
Age	(20years-30years)	26	12	1.254(.572-2.748)	.968(.372-2.520)
	(31years-40years)	9	0		
Occupation	Unemployed	15	8	4.54(.223-.928)	.372(.141-.954)*
	Employed	18	4		
Marital status	Single				
	Married	12			
Religion	Muslim	13		1.305(.639-2.666)	.666(.290-2.120)
	Christian	22			
Education	No formal education	2	0	1.168(.263-5.184)	
	Literate	33	12		
Income	Less than 5000	11	8	.505(.183-1.394)	.326(.326-3.086)
	>= 5000	24	6		
Physical exercise at least once per week	Yes	32	11	1.317(.389-4.460)	.929(.268-3.224)
	No	3	1		
Frequency of fasting	2 times				
	three times or more	35	12		
Frequency of eating fruits & vegetable	Every day	35	12	1.11(2.399-7.59)	.205(.211-.221))*
	Once up to three times per week	-	-		
Frequency of eating fat	Every day	3	2	1.579(.452-5.512)	2.135(.578-7.8885)
	Once or three times per week	32	10		
Frequency of eating carbohydrate	Every day	32	12	3.749(1.127-12.476)	3.582(1.041-12.326)*
	Once or three times per week	3	-		

“NB: Variables having a P value  $\leq 0.25$  in bivariate analysis included in the multivariable analysis, \*statistically significant at p-value  $< 0.05$

Multivariate analysis was done to evaluate an association between dependent and independent variables. Employed women has about 0.372 times less likely to be excessive weight gain (AOR= .372( .141- .954)) than unemployed ones.



## 4. Discussion

In this study, the majority of participants, 201 (47.6%), were between the ages of 20 and 25. Regarding their parity, most of them, 179 (42.4%), had delivered two children.

The frequency of eating or meal patterns during pregnancy can be an important component of maternal nutrition relevant to pregnancy outcomes. According to the Institute of Medicine recommendations, pregnant women should have three meals and two snacks per day. In this study, 280 (66.4%) participants ate four times per day, and 112 (26.5%) ate more than four times per day. Additionally, 394 (93.4%) consumed fruits and vegetables every day, while only 30 (7.1%) consumed fats daily. Furthermore, 303 (71.8%) consumed carbohydrates daily, and 53 (12.6%) did not engage in any physical exercise during their current pregnancy. This is quite different from a study conducted in Harari, where only 16.5% of women ate food at least three times a day during their current pregnancy, and 81.5%, 79.1%, and 91.7% consumed fruits and vegetables, meat, and eggs at least once a week, respectively [12]. During their current pregnancy, 65.2% did not engage in any physical activities. This variation may be due to geographical and socio-economic differences between the regions.

In this study, 375 (88.9%) of the participants gained an adequate amount of weight, while 35 (8.3%) gained excessive weight and 12 (2.8%) gained insufficient weight. This differs from a study conducted in Ireland on risk factors for excessive gestational weight gain in healthy nulliparous women, which found that 17% of 1950 women gained weight within the recommended range, 74% had excessive weight gain, and 9% had inadequate weight gain [11]. This variation could be due to socio-economic differences. It also contrasts with a study in the Harari Regional State, Eastern Ethiopia, which reported that 69.3%, 28%, and 2.7% of women gained inadequate, adequate, and excessive gestational weight, respectively [12]. However, it is somewhat similar to a study on gestational weight gain and pregnancy outcomes in Asian Indian women, which found that 5.6% (n = 154) were underweight, 29% (n = 791) were normal weight, and 18.5% (n = 504) were overweight [13].

In this study, consuming fruits was significantly associated with the excessive weight gain. Pregnant mothers with a consuming fruits were 0.205 less likely to be develop excessive weight gain compared to those without consuming fruits (AOR = 0.205, 95% CI 0.211, 0.221). These findings are consistent with those of the study conducted in the Harari Regional State [12].

Consuming carbohydrates was another significantly factor associated with excessive weight gain in this study. Pregnant mothers with a consuming fruits were 3.58 times more likely to be develop excessive weight gain compared to those without consuming carbohydrates (AOR = 3.58, 95% CI 1.041, 12.326). These findings are consistent with those of the study conducted in the Harari Regional State [12].

## 5. Conclusion and Recommendation

### 5.1. Conclusion

According to the findings of this study, 35% of women experienced excessive weight gain. Unemployment and daily consumption of carbohydrates and fruits are significantly associated with this excessive weight gain. Women of childbearing age should be informed about the importance of consuming fruits and vegetables and reducing carbohydrate intake during pregnancy to prevent excessive weight gain.

### 5.2. Recommendation

To the Ministry of Health and Addis Ababa Health Bureau: Efforts should continue to inform women of childbearing age about the importance of conceiving at a normal weight, maintaining a balanced diet, engaging in physical activity during pregnancy, and achieving healthy gestational weight gain. Additionally, there is a need to develop guidelines on gestational weight gain to optimize pregnancy and birth outcomes in low- and middle-income countries. Further studies with larger populations are also needed.

## 6. Limitations of the Study

We could not establish causal relationship given that this was a cross-sectional study. The study was conducted in St. Paul's.

## Abbreviations

AMBC	Africa Medical and Business College
ANC	Ant Natal Care
AOR	Adjusted Odd Ratio
BMI	Body Mass Index
CI	Confidence Interval
EDHS	Ethiopian Demographic Health Survey
GDM	Gestational Diabetes Mellitus
GWG	Gestational Weight Gain
GHNT	Gestational Hypertension
HNT	Hypertension
LBW	Low Birth Weight
OR	Odd Ratio
SPSS	Statistical Package for Social Science
WHO	World Health Organization

## Ethics Approval and Consent to Participate

Ethical clearance was secured from the institutional review board (IRB) of the St. Paul's hospital Addis Ababa with approval identification PM23/100, and permission and support latter were secured from the research and ethical

review board of St. Paul's College (OF02SPH/4214/16) for respective hospital administrators before data collection. Informed consent was obtained from volunteer participants. Each respondent was informed by the data collectors about the purpose and expected benefits of the study. The respondents also had been given the right to refuse to take part in the study as well as to withdraw at any time during the study. Confidentiality and anonymity were ensured throughout the process of the study. In addition, the study was conducted in conformity with all applicable rules and regulations.

## Acknowledgments

We are incredibly grateful to all study participants for their voluntary participation in the interview process. We also extend our acknowledgment to Saint Paul's hospitals who gave their time and information to make this study possible.

## Author Contributions

Megbar Yilie Alemu is the sole author. The author read and approved the final manuscript.

## Data Availability Statement

Epi Info version 7.1 and SPSS version 26 data for this article are available upon reasonable request from the corresponding author.

## Conflicts of Interest

The authors declare no conflicts of interests.

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