BMJ Paediatrics Open

BMJ Paediatrics Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Paediatrics Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjpaedsopen.bmj.com).

If you have any questions on BMJ Paediatrics Open's open peer review process please email info.bmjpo@bmj.com

BMJ Paediatrics Open

Utilization of Growth Monitoring and Promotion Service and Associated Factors among Mothers of Children Aged 0-23 Months Old in Mettu Town, South West Ethiopia

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2022-001588
Article Type:	Original research
Date Submitted by the Author:	24-Jun-2022
Complete List of Authors:	Tufa, Yohanis ; Mettu Health Science College, Department of Health Exension Service Mitiku, Abeza; Mettu University, Public Health; Shemsu, Shuayib ; Mittuniversitetet, Department of Public Health Bidira, Kebebe; Mettu University, Department of Nursing
Keywords:	Adolescent Health, Growth, Obesity

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Original Research Artcle

Utilization of Growth Monitoring and Promotion Service and Associated Factors among Mothers of Children Aged 0-23 Months Old in Mettu Town, South West Ethiopia

Yohannes Tufa[1], Abeza Mitiku[2], Shuayib Shemsu[2], Kebebe Bidira[3]

[1] Department of Health Exension Service , Mettu Health Science College, Mettu, Ethiopia

[2] Department of Public Health, College of Health Science, Mettu University, Mettu, Ethiopia

[3] Department of Nursing , College of Health Science, Mettu University, Mettu, Ethiopia

Correspondence should be addressed to Abeza Mitiku ; abzmtk@gmail.com

Abstract

Background: Growth monitoring and promotion (GMP) is a preventive activity comprised of growth monitoring (GM) that serves as the core activity in an integrated child health and nutrition program. In most developing nations, including Ethiopia, however, the use of growth monitoring and promotion services is insufficient.Hence, the purpose of this study was to evaluate the use of GMP services and associated characteristics among womens with children aged 0–23 in Mettu, Southwest Ethiopia.

Objective: To assess utilization of growth monitoring and promotion service and associated factors among mothers with children aged 0-23 months old in Mettu town, South West Ethiopia, 2021.

Method: A community-based cross-sectional study was conducted among 372 randomly selected mothers with children aged 0–23 months old from June 25 to July 27, 2021 in Mettu town. Epi-data version 4.6.0 was used to enter data, which was then exported to SPSS version 25 for analysis. Bivariate and multivariate logistic regression were performed to identify factors associated with GMP utilization.

Results: A total of 372 study participants were included in the study yielding a response rate of 95.2%. The proportion of GMP utilization was 25.2% [95% CI: 24.1-33.0]. In multivariable regression analysis, Age of index child 0-11months [AOR=1.58; (95% CI: 1.052, 3.713)], early-PNC [AOR=1.72; (95% CI=1.657, 6.467)], middle tertile wealth status [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile wealth status [AOR=0.073; (95% CI (0.013-0.874)], family health card [AOR=2.09; (95% CI; 1.384, 5.343)] and time to reach health facility [AOR=2.23; (95%CI: 2.061, 7.350)] were significantly associated with GMP service utilization.

1

Conclusion and recommendation: In this study, only one-fourth of mothers with children aged 0–23 months old were utilizing GMP services. GMP service utilization was found to be significantly associated with child age, early-PNC, wealth status, family health card, and time to reach nearby health facility.Hence, utilization of family health cards and early-PNC should be encouraged both at institutional and community level.

Key words: Growth Monitoring, Utilization, Mettu town, Children Aged 0-23Months

1. Introduction

Growth monitoring is defined as the regular measuring, plotting, and interpreting child's growth on a regular basis in order to counsel or intervene when abnormal growth is found, with the goal of improving the child's nutritional status[1]. Improved nutritional status, increased utilization of the health services, and ultimately reduction in mortality are the main expected benefits of growth monitoring and promotion [2].

The majority of growth monitoring and promotion takes place in health institutions or in communities. The main benefit of growth monitoring is that it assists families and community workers in recognizing children with growth failure early, when it is easier to intervene[3–5].

Child growth and development is one of the most serious public health issues in low and middle income countries[6]. Poor child growth is associated with increased child mortality due to severe infections and increased vulnerability to common childhood illnesses, which contributes to the majority of deaths among children under the age of five[7]. Malnutrition is directly or indirectly responsible for about half of all childhood deaths worldwide [8]. In 2019, there were 149 million children under the age of five in the world. Out of those, 49 million were stunted, 17 million were severely wasted, and 40 million were overweight [9].

Child malnutrition is a major public health problem in Ethiopia. According to the Ethiopian Demographic and Health Survey, 37% of children under the age of five were stunted, 21% were underweight, and 7% were wasted. Similarly, in the Oromia region, 35.6% of children were stunted, 16.1% were underweight, and 4.7% were wasted[10]. In terms of the country's economic losses, the estimated annual costs of child malnutrition are 55.5 billion Ethiopian birr (ETB), or 16.5% of GDP[11].

The most cost-effective way to address the pressing public health issue of malnutrition is to prevent it through the use of various preventive techniques, including GMP. That means ensuring that all

2

children who are normal weight at birth remain in that range, and that those who are low weight at birth are quickly brought into a healthy growth range[3].

It is critical to promote and improve a child's health during the window of opportunity, which runs from conception to the child's second birthday[12]. Despite the fact that GMP is one of the activities that the Ethiopian government is currently focusing on to combat child malnutrition, only a few mothers brought their children for this service [13] ,[14]. Studies done in different parts of Ehioipia revealed that only 16.9-38.9% proportion of mothers were attending GMP service [14–19]. Lack of appropriate information about GMP service, lack of support from husbands, distance from the health facility, pastoral life style and cultural issues such as the consideration of "evil eye" were factors contributed for ulilization of GMP service[17, 20].

The irregularity of the GMP session due to health extension work load, not recording the age and weight of the child accurately, mother's wrong belief and skill gap of health extension workers were challenges of GMP utilization [17]. Since 2008, Ethiopia has adopted GMP as a nutrition-specific intervention, but utilization of growth monitoring and promotion services has been restricted[13].

However, limited evidence is available on the level of utilization of the GMP services in Mettu town. Hence, this study intended to find out how widely GMP services are being utilized and what factors affected the program in the Mettu town.

2.1. Study area and period

The study was conducted in Mettu town from June 25 to July 27/2021 which is found in I/A/Bor Zone, Oromia region, South West Ethiopia and located 542 km from Addis Ababa, the capital city of Ethiopia. Mettu is a market town with six administrative kebeles. One health center, one specialized hospital, and three health posts are found in the town. The total population of the town is estimated to be 49,538. Under five and under two age groups were estimated to be 8,139 and 2,828 respectively.

2.2. Study design and Population

Community-based cross-sectional study was employed from June 25to July 27/2021. All mothers who have children aged 0-23 months old and live in Mettu town were the source population ,whereas mothers who have children aged 0-23 and fully meeting the inclusion criteria were the study population and included in the study. Mothers who were unable to respond due to medical or psychiatric illness were excluded.

3

2.3. Sample size Determination

The minimum required sample size was calcualted using a double population proportion formula using Epi Info™ version 7 by considering the assumptions (80%) power of the study, 95% confidence level, 1:1 ratio) and proportion of outcome for the variable, place of delivery (33.33% exposed and 10.33% non-exposed). After adding a **10%** none response rate the final sample size for the study was **372**(table 1).

Table 1: Sample size determination to assesse the utilization of GMP among mothers of children aged 0-23 months old in Mettu town, South West Ethiopia 2021.

S/N	Variable	Assumptions						Sample size	Reference
		CI (%)	Power (%)	Ratio	AOR	Proportion of outcome			
						Exposed	Non exposed		
1.	Place of delivery	95	80	1:1	3.0	33.33%	10.33%	372	[18]
2.	Family health card	95	80	1:1	5.09	57.86%	11.14%	139	[20]
3.	Distance from near by health facility	95	80	1:1	4.53	33.90%	8.0%	359	[19]

2.4 Sampling techniques and procedures

All six urban kebeles were included in the study to achieve the desired sample size. Initially, a sampling frame containing a list of 2,828 containing mothers-child pairs aged 0-23 months old along with child's date of birth and house number was obtained from the respective health posts. Then samples representing each kebele were calculated using proportion to population size allocation.

Finally, a simple random sampling technique was employed using computer generated program (Microsoft-excel) to select a total of 372 samples from the six urban kebeles.

2.5 Data collection procedures and tools

Data were collected from mothers using a semi-structured interviewer administered questionnaire. The questionnaire was adapted from previous similar studies [17], [20], [22]. The questionnaire was first prepared in English and then translated to Afan Oromo and back to English to check the consistency by an expert who had a good ability of both languages. The questionnaire was divided into five sections:, socio-demographic and economic information, child and maternal health

4

characteristics and mother-child feeding knowledge, maternal knowledge of the WHO growth chart and GMP service, and the availability and accessibility of health services.

Data were collected by house to house visit using interviewer-administered semi-structured questionnaire the younger child from the household was taken as an index child, and if twin children were found within one household, data were taken from one of them using lottery method. If eligible mother was absent during the data collection period, revisit was done three times, and mothers absent on the third visit were considered as non-respondent.

2.6 Data quality control

Before data collection, the questionnaires were pretested on a 5% (20) sample size in another town, which was not part the actual data collection area. Based on the pretest, some modifications were made to the questionnaires. Two days of training was given for data collectors and supervisors by the principal investigator on data collection tools, data collection techniques, approach to the interviews, and maintaining the privacy and confidentiality of the respondents. Every day after data collection, the questionnaires were reviewed and checked for completeness by the supervisors and the principal investigator.

Data was collected by six dippoloma Clinical Nurese using pretested and semistructured questionnaires through a house-to-house visit of mothers who have a children aged 0-23 months. Two BSc nurses were recruited as supervisors during data collection. If the eligible mother was absent from the home at the time of data collection, a revisit was done three times, and the mother who was absent at the third visit was considered as non-respondent.

2.7 Patient and public involvement

No patient involved in this study.

2.8 Operational definition

- **Utilization**: participation of a child for GMP services at least once for 0 month, at least two times for 1±3 months, at least five times for 4±11 months and at least four times per year for 12±23 months. In addition, it should be plotted or recorded on the child growth chart.[18], [23].

5

- **Family health card utilization:** the mother is considered as utilized of family health card, if she had the cards at home, plotted and able to interpret information displayed on weight for age child growth chart during every GMP sessions.
- **Early Postnatal care:** is the care given to the women and her new-borns at least once from the second days through seventh days after delivery [24]

2.9 Data processing and analysis

All data were checked visually, coded, and entered into Epi-data version 4.6.0 and exported into SPSS version 25 software packages for analysis. Descriptive statistics (frequency and cross tabulation) were calculated for variables. The results were presented in the form of tables and text using frequencies and summary statistics such as mean, standard deviation, and percentage to describe the study population with relevant variables.

Before performing Principal Component Analysis (PCA) for variables explaining household wealth index, all the necessary assumptions and prerequisites were checked. The degree of association between independent and dependent variables were assessed using odds ratio with 95% confidence interval. Simple binary logistic regression analysis was performed to select candidate variables for multivariable regression analysis. Variables with p-value<0.25 were taken as cut-off point to select eligible variables for the multivariable regression analysis and p-value<0.05 was declared as statistically significant in the final model.

Pseudo regression was performed to check multi-collinearity between independent variables, the minimum tolerance and maximum variance inflation factor (VIF) was found to be 0.80 and 1.89 respectively. For the finally fitted multivariable logistic regression model, the adequacy of the model to predict the outcome variables was checked to predict the outcome variables was checked by Hosmer-Lemeshow goodness-of-fit and p-value>0.05.

3. RESULT

3.1. Socio-demographic and economic characteristics of households.

In this study total of 372 mother-child pairs were included yielding a response rate of 95.2%. The mean age (month) of the children was 11.25±6.433SD and more than half the children 187(52.8%) belongs to the age category below 11 months. Regarding the age of respond, majority of them were in the age category below 30years.The mean age (year) of the mothers was 24.91±3.472SD. More

6

than half of the respondents 181(58.1%), were attended secondary and above education . Nearly half 160(45.3%) of the respondents were housewives. In-terms of wealth status of, 116(32.8%) and 93(26.2%) ranked under higher and lower tertiles wealth status respectively. **(Table 2)**

Table 2:Demographic and socio-economic characteristics of mothers with children aged 0-23months, Mettu town, 2021. (n=354)

Variable	Categories	Frequency	Percentage
Sex of the child	Male	184	51.6
	Female	171	48.4
Age of a child/months	0-11	187	52.8
	12-23	167	47.2
Maternal Age	<30	329	92.9
	≥30	25	7.1
Religion of mother	Orthodox	136	38.5
	Muslim	111	31.4
	Protestant	96	27
	Others*	11	3.1
Ethnicity of Mother	Oromo	289	81.7
	Amhara	36	10.1
	Gurage	14	4.00
	Others**	15	4.20
	No formal education	32	9.0
Level of education	Primary	141	39.8
	Secondary and above	181	51.2
	House wife	160	45.3
Occupational status	Merchant	36	10.2
	Government employee	53	14.9
	Private employee	48	13.7
	Student	39	10.9
	Others***	18	4.97
Current marital status	Married	321	90.7
	Single	20	5.6
	Divorced	11	3.1
	Widowed	2	0.6
Family size	<3	96	27.2
	4-5	165	46.5
	>5	93	26.3

7

Wealth status	Lower tertile	93	26.2
	Middle tertile	145	41.0
	Higher tertile	116	32.8

*Catholic, Wakefata, &Jiohava   **Kambata, Hadiya, Tigre, Agnuak&Nuer ***Daily labourer

3.2. Information on availability of health facility with specific health services

In this study, nearly half 168(47.5%) of the study participants takes thirty minute and below to reach the nearest health facility. More than two-thirds 272(76.7%) of respondents prefer to go health centres for their child's care. Regarding perceived awareness of the respondents on the availability of GMP services, half of 187 (52.8%) of the respondents were aware of the availability of GMP services at health facility **(Table 3).**

Table 3: Information on availability and accessibility of health services among mother-child pair, Mettu town, 2021. (n=354)

Variable	Category		Frequency	Percentage
Time it takes to the nearest health facility	≤30minutes		168	47.5
	>30minutes		186	52.5
The most frequently visited health facility for child care.	Health centre		272	76.7
	Health post		9	2.5
	Private clinic		51	14.3
	Hospital		23	6.5
Perceived awareness on availability of specific health Services	ANC	Yes	318	89.8
		No	36	10.2
	Delivery	Yes	301	85.1
		No	53	14.9
	PNC	Yes	242	68.3
		No	112	31.7
	GMP	Yes	187	52.8
		No	167	47.2

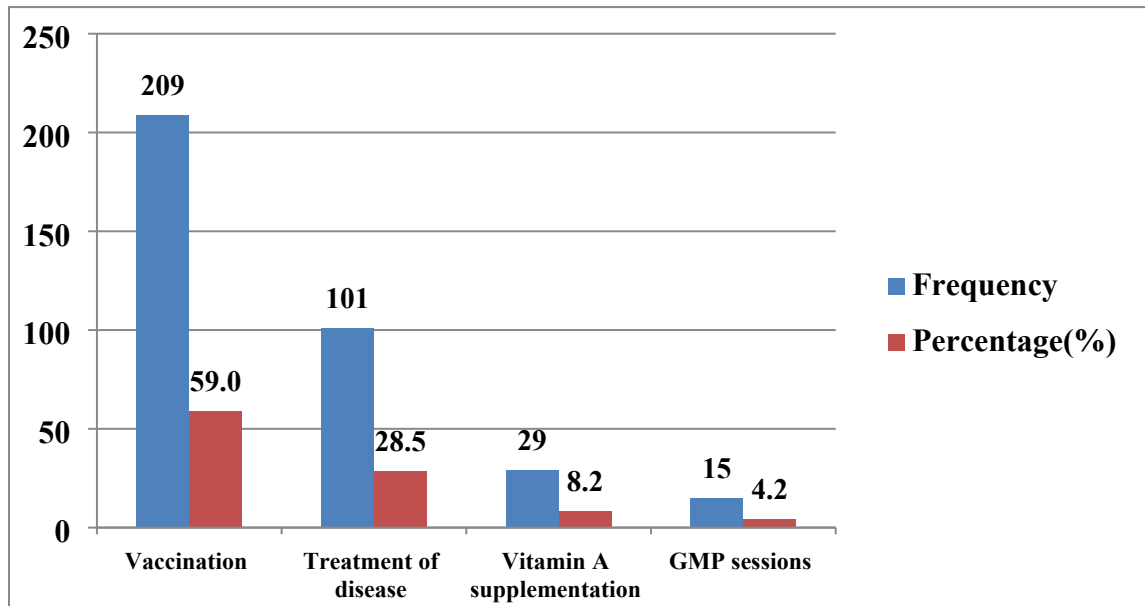## 3.3. Information on utilization of maternal and child health service

Among 354 mothers participated in this study, more than half 181(55.5%) the mothers had ANC follow-up with frequency of visits four and more. Majority of the mothers 334(94.4%) delivered at health institution but, only one third 123(34.8%) of the mothers had an early PNC. **(Table 4)**

Table 4: Variables used to assess the information on MCH service among mothers and their children, Mettu, Ethiopia, 2021 (n=354)

Variable	Category	Frequency	Percentage
ANC follow-up	No	25	7.1
	Yes	329	92.9
Frequency of ANC follow-up	<4 visits	147	44.8
	≥ 4 visits	181	55.5
Place of delivery	Home	20	5.6
	Health institution	334	94.4
Early-PNC	No	231	65.2
	Yes	123	34.8
Vaccination status of the child	Not vaccinated	9	2.5
	Vaccinating	137	38.8
	Defaulter	6	1.6
	Fully vaccinated	202	57.1
Reason for not vaccinated	Distance to EPI sites	1	12.5
	Do not know the benefit	8	87.5

3.4. Reasons for frequent health facility visits by Mothers

The finding of this study revealed that, nearly two-thirds 209(59.0%) of the mothers frequently visits health facility to have their child's vaccinated, only 15(4.3%) of the mothers who participated in the study took their children for weighing or GMP service. **(Figure 3)**

9

Figure 1: Mothers most common reason to visit health facility, Mettu town, 2021. (n=354)

3.5. Child feeding and growth monitoring knowledge of Mothers

The finding of this study reported that, majority of the respondents 310(87.6%) were counselled on child feeding. Almost all respondents 347(98.1%) were provided breast milk to their babies immediately after birth. Nearly half 166(46.9%) of the study participants were utilizing family health cards and the majority 153(92.05%) of those utilized mothers were able to read and interpret information displayed on the growth chart. **(Table 5)**

Table 5:Child feeding and growth chart knowledge of mothers, Mettu town, 2021. (n=354)

Variable	Category	Frequency	Percentage
Counselled by HCWs on child feeding	No	44	12.4
	Yes	310	87.6
The first thing given after birth	Breast milk	347	98.1
	Other*	7	1.86
Time for BF initiation immediately after birth	Within 1hr	342	96.7
	Greater than1hr	11	3.1
Duration of EBF	3 months	7	1.9
	6 months	344	97.2
	1 year	3	0.9
Total duration of BF	Below 2year	33	9.33

	2year and greater	321	90.68
Do utilize family health card at home.	No	188	53.1
	Yes	166	46.9
Can you read information displayed on growth chart	No	13	7.95
	Yes	153	92.05
Who thought you	HCWs	99	64.95
	By my self	46	30.01
	HEWs	8	5.04
What does it mean if growth curve flattens	Child not growing well	72	46.8
	Child may be sick	31	20.3
	Child not eating well	50	32.9
What does it mean if growth curve rising	Child gaining weight	89	58.4
	Child is healthy	16	10.6
	Child is eating well	48	31.0
What does it mean, if growth curve is falling	Child is not gaining weight	66	43.2
	Child may be sick or has been sick	36	23.4
	Child is not eating well	51	33.4

Other* Formula milk, water, cow milk

3.6. Utilization of GMP services

This study revealed that, one-fourth 89(25.2%) of the mothers were utilized GMP service with [95% CI 24.1-33.0]. From those respondents participated in this study, nearly two-thirds 196 (60.9%) knows the benefit of GMP. Half 108(50.5%) of the respondents reported as, "to monitor the child's growth" when asked for the benefit of GMP sessions. More than two-thirds 59(66.7%) of the respondents followed GMP sessions at health centre **(Table 6)**
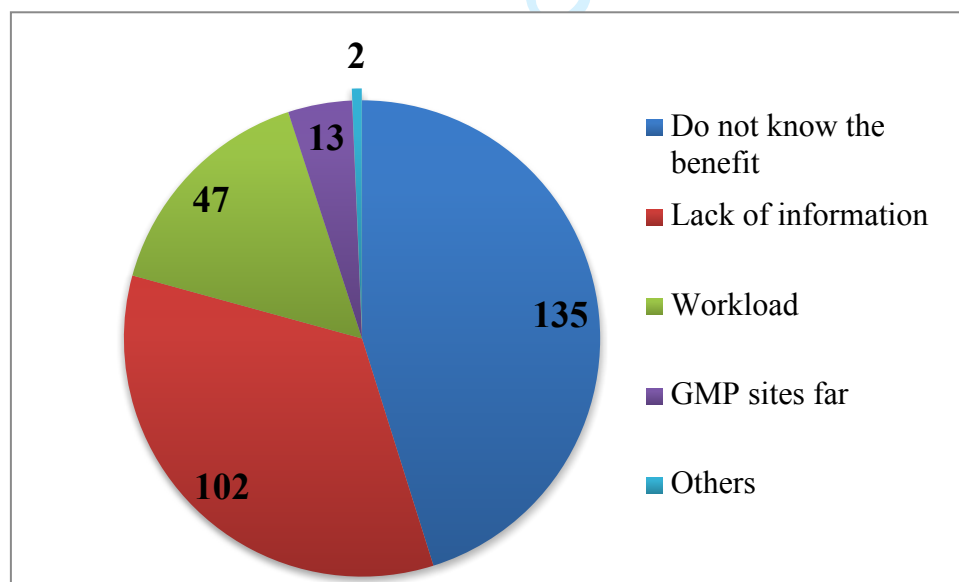
Table 6: Variables to assess utilization of GMP, Mettu town, 2021. (n=354)

Variable	Category	Frequency	Percentage
GMP utilization status			
	Utilized	89	25.2
	Not utilized	265	74.8

11

Know benefit of regular GMP session	Yes	216	60.9
	No	138	29.1
Benefit of regularly taking the child for GMP session	To monitor growth	108	50.0
	To seek medical care	7	3.06
	To know health status	101	46.94
Place where GMP given	Health centre	59	66.7
	EPI outreach sites	8	8.45
	Health posts	22	24.85
Who provides the service	HEWs	30	33.15
	HCWs	59	66.8

3.6.1 Reasons for not taking the child for GMP session

This study reported that, more than one-thirds 135(38.2%) of the respondents who missed to take the child for GMP sessions didn't know the benefits of the GMP services and 102(28.9%) of the mothers lack the information about the services. **(Figure 4)**

Figure 2: Reasons for not regularly taking the child for GMP session, Mettu town, 2021. (n=354)

3.7. Factors associated with GMP service utilization

On multivariable logistic regression analysis, mothers with children aged 0-11 months old [AOR=1.58; (95% CI:(1.052, 3.713)], Mothers who had early-PNC [AOR=1.72; (95% CI :(1.657, 6.467)], mothers from households with middle and [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile [AOR=0.073; (95% CI (0.013-0.874)], mothers utilizing family health card at home [AOR=2.09; (95% CI; 1.384, 5.343)]. Mothers who took thirty minutes and below to reach the nearest health facility [AOR=2.24; (95%CI: 2.061, 7.350)] were factors significantly associated with utiolization of GMP **(Table 7)**

Table 7: Bi-variable and multi-variable logistic regression analysis of GMP utilization among mothers of children aged 0-23months in Mettu town, 2021. (n=354)

Variable	Category	Utilization of GMP		95% CI	
		Yes(%)	No(%)	COR	AOR
Age of index child	12-23months	32(9.01)	135(38.2)	1	1
	≤11months	57(16.15)	130(36.6)	1.87(1.112-3.143)	**1.58(1.052-3.713)****
Frequency of ANC visit	<4	28(7.91)	107(30.22)	1	
	≥4	61(17.23)	110(31.07)	2.12(1.204-3.519)	1.16(0.579-2.305)
Early-PNC	No	46(13.04)	185(52.2)	1	
	Yes	43(12.1)	80(22.7)	2.14(1.277-3.577)	**1.72(1.657-6.467)****
Maternal level of education	No formal education	6(1.60)	26(7.40)	1	
	Primary	27(7.51)	114(32.25)	1.17(0.404-3.356)	0.645(0.179-2.320)
	Secondary and above	56(15.8)	125(35.4)	2.15(0.775-5.946)	0.319(0.088-1.160)
Wealth status	Higher tertile	62(17.5)	54(15.25)	**1**	**1**
	Middle tertile	17(4.80)	128(36.16)	0.116(0.016-0.311)	**0.108(0.047-0.319)****
	Lower tertile	10(2.82)	83(23.45)	0.099(0.012-0.697)	**0.073(0.013-0.874)****
Family health	No	33(9.31)	155(43.8)	1	

card utilization	Yes	56(15.8)	110(31.1)	2.40(1.427-4.027)	**2.09(1.384-5.343)****
Perceived	No	27(7.76)	133(37.6)	1	
awareness on	Yes	62(17.4)	132(37.3)	2.26(1.323-3.858)	1.67(0.871-3.203)
GMP availability					
Time to reach	>30minutes	31(8.76)	155(43.78)	1	
nearby health	≤ 30minutes	58(16.38)	110(31.07)	2.64(2.410-7.297)	**2.23(2.061-7.350)****
facility					

Note: ** denote statistically significant variables in multivariable logistic regression at *p-value* <0.05, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

4. DISCUSSION

GMP services are essential until the child's second birthday in order to have a healthy and well-nourished child and to break the intergenerational cycle of malnutrition. Hence, this study was aimed to assess utilization of growth monitoring and promotion services and associated factors among mothers of children aged 0-23 months old in Mettu town. The proportion of GMP service utilization in this study area was found to be 25.2% with [95% CI 24.1-33.0]. This finding is comparable with a study conducted in rural lower part of Ghana 28.5% and Northern Ethiopia 30.7%[20], [25].

The finding of this study is lower compared to a study conducted in Lawra district of Ghana 70% and Nyamira country of Kenya 53.3%[16], [26]. The inconsistency might be due to, differences in socio-economic characteristics among study population, study design and study period.

However, the finding of the current study was higher compared to a study done in Thika sub-city of Kenya 20%, Mareka district, southern Ethiopia, 16.9% and Butajira District, southern Ethiopia,11%[17], [18], [27]. The possible justification for the discrepancy might be differences in study setting, socio-economic and demographic characteristic among study participants and study period.

The age of index child was found to be significantly associated with utilization of growth monitoring and promotion services. Mothers with index child below 11months were more 1.5 times more likely to utilize GMP compared to mothers with index child aged 12-23months old. The possible explanation might be, children below 11 months old are recommended to go for several doses of immunization. Thus, most mothers will continue to send them to weighing centres until completion of the immunization. However, as the child's age advances, attendance at GMP sessions decreases.

14

This finding is similar to a study conducted in rural Ghana, which discovered a negative correlation between child age and GMP utilization. [25]. In contrast to this finding, a study conducted in the southern districts of South Wollo and Mareka found that mothers with index children aged 12-24 months were more likely to utilize GMP services than those aged 11 months or less.[18], [19]. The inconsistency might be due to the differences in study design and sampling technique employed.

Mothers who had early-PNC were 1.7 times more likely to utilize growth monitoring and promotion services compared to those mothers who had no early-PNC. The possible reason might be mothers who had early-PNC have frequent contact with health care providers. As a result, they may have more opportunities to receive child growth and development counseling. There is no other relevant study with this finding.

Utilization of family health card was another predictor of growth monitoring and promotion services in this study. Those mothers utilizing family health card were 2 times more likely to utilize growth monitoring and promotion services compared to those who are not. This might be due to the possibility of family health cards motivating mothers to get GMP. This finding congruent with a study done in Yilmana woreda of northern Ethiopia[20].

Compared to those mothers from households with higher tertile wealth status, mothers from households with lower and middle tertile wealth status were 89% and 92% less likely to utilize GMP services respectively. The study done in Southern Ethiopia supports this finding[18].The posiible explanation could be, people with lower household tertile mght be busy to fulfil their day to day livelihood need.

The time it takes to reach nearby health facility was found to be significantly associated with GMP service utilization. Those mothers who took less than 30 minutes to reach a nearby health facility were more 2 times likely to utilize GMP than those mothers who took more than 30 minutes to reach a nearby health facility. This finding was in line with the studies conducted in Yilmana Dedisa and Butajira district[17], [20]. This could be because mothers who live near a health facility can bring their child for GMP service quickly and return to work, even if they are busy at work.

15

4.1. Strength and Limitation of the study

There are certain limitations to this research. First, since the data was collected by the verbal report of the participants, there might be a possibility of response bias. Second, the study did not assess the qualitative perspective of GMP utilization.

5. Conclusions and Recommendation

The study found that only one-fourth of mothers with children aged 0-23 months in Mettu town were utilizing GMP services. Ages of index child, early-PNC, utilizing family health card, wealth status, and time to reach nearby health facility were significantly associated with GMP service utilization. Hence, utilization of family health card and early-PNC should be encouraged both at institutional and community level.

Abbreviation

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; CI: Confidence Interval, GMP: Growth Monitoring and Promotion , HEW: Health Extension Worker, ANC: Antenatal Care, PNC: Postnatal Care, NNP: National Nutrition Program.

Authors' contributions

YT; developed the research idea, design, analysis, and drafted the manuscript. AM, SHSH, and KB conceived the study, supervised the data collectors, interpret the result and reviewed the manuscript. All authors read and approved the final manuscript. YT is responsible for the overall content as guarantor.

Data Availability

The data sets analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgment

16

Ethical Approval and Consent to Participate

 Ethical clearance was obtained from the ethical review board of Mettu University, College of Health Science (Ref.No.RPG 42/20) submitted to Mettu town health office. The letter of permission was obtained from Mettu town health office. Before beginning the data collection, written consent was obtained from the study participants, after clear information was provided about the objectives of the study. The study was conducted in accordance with the Helsinki Declaration.

Conflict of Interest

The authors declare that they have no competing interests regarding the publication of this article.

REFERENCES

[1]   P. Garner, R. Panpanich, and S. Logan, "Is routine growth monitoring effective? A systematic review of trials... including commentary by Davies DP.," *Arch. Dis. Child.*, vol. 82, no. 3, pp. 197–201, 2000, [Online]. Available: http://www.epistemonikos.org/documents/e2b62e1929a334513c1b4fd795155729f2284025.

[2]   A. Ashworth, R. Shrimpton, and K. Jamil, "Growth monitoring and promotion: Review of evidence of impact," *Matern. Child Nutr.*, vol. 4, no. SUPPL.1, pp. 86–117, 2008, doi: 10.1111/j.1740-8709.2007.00125.x.

[3]   M. Griffiths and J. Del Rosso, "GROWTH MONITORING AND THE PROMOTION OF HEALTHY YOUNG CHILD GROWTH: Evidence of Effectiveness and Potential to Prevent Malnutrition," *Matern. Child Nutr.*, no. November, pp. 86–117, 2008.

[4]   UNICEF, "Experts ' consultation on growth monitoring and promotion strategies : Program guidance for a way forward Recommendations from a Technical Consultation UNICEF Headquarters New York , USA," pp. 1–8, 2008.

[5]   N. Mangasaryan, M. Arabi, and W. Schultink, "Revisiting the concept of growth monitoring and its possible role in community-based nutrition programs," *Food Nutr. Bull.*, vol. 32, no. 1, pp. 42–53, 2011, doi: 10.1177/156482651103200105.

[6]   C. Lu, M. M. Black, and L. M. Richter, "Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level," *Lancet Glob. Heal.*, vol. 4, no. 12, pp. e916–e922, 2016, doi: 10.1016/S2214-109X(16)30266-2.

[7]   UNICEF, *Tracking Progress on Child and Maternal Nutrition*. 2009.

[8]   Unicef, World Health Organization, and T. W. Bank, "Levels and Trends in Child malnutrition. Key findings of the 2018 edition," *Midwifery*, pp. 1–6, 2018.

17

[9]   U. Who and W. Bank, "Levels and trends in child malnutrition," 2019.

[10]   M. Demographic, H. Survey, and K. Indicators, *Mini Demographic and Health Survey*. 2019.

[11]   arican development bank and agance frace development Wfp, "The Cost of hunger in Africa: Ethiopia WFP," 2014.

[12]   T. H. E. Foundation and F. O. R. Development, "INVESTING IN NUTRITION," 2015.

[13]   N. P. Planning, F. Health, and A. P. Managers, "Nutrition Program Planning and Supervision : For Health and Agriculture Program Managers Reference Manual July 2013 Nutrition Program Planning and Supervision : For Health and Agriculture Program Managers Reference Manual," no. July, 2013.

[14]   A. Yeshaneh, T. Fentahun, T. Belachew, A. Mohammed, and D. Adane, "Utilization of growth monitoring and promotion services and associated factors among children aged 0-23 months in Banja District, Northwest Ethiopia 2020: A crosssectional study," *PLoS One*, vol. 16, no. 11 November 2021, pp. 1–14, 2021, doi: 10.1371/journal.pone.0259968.

[15]   S. M. Bilal, A. Moser, R. Blanco, M. Spigt, and G. J. Dinant, "Practices and challenges of growth monitoring and promotion in Ethiopia: A qualitative study," *J. Heal. Popul. Nutr.*, vol. 32, no. 3, pp. 441–451, 2014.

[16]   D. Tuobom Debuo, "Caregivers Knowledge, Attitude and Practices on Child Growth Monitoring and Promotion Activities in Lawra District, Upper West Region of Ghana," *Sci. J. Public Heal.*, vol. 5, no. 1, p. 20, 2017, doi: 10.11648/j.sjph.20170501.13.

[17]   L. Desalegne, S. Shiferaw, D. Haile, and T. Submitted, "Assessment of Knowledge and Utilization of Growth Monitoring and Promotion for under two children in Butajira, Ethiopia 2017," no. June, 2017.

[18]   F. W. Feleke, A. A. Adole, and A. M. Bezabih, "Utilization of growth monitoring and promotion services and associated factors among under two years of age children in Southern Ethiopia," *PLoS One*, vol. 12, no. 5, pp. 1–9, 2017, doi: 10.1371/journal.pone.0177502.

[19]   S. Dagne, "Determinants of Growth Monitoring and Promotion Service Utilization Among Children 0-23 Months of Age in Northern Ethiopia : Unmatched Case Control Study," *Res. Sq.*, vol. 1, pp. 15–20, 2020.

[20]   S. Yeniew, "Utilization of Growth Monitoring and Promotion Service By Mothers of Children 0-23 Months Old in Yilmana Denisa Woreda ," 2020.

[21]   S. Dagne, J. Aliyu, Y. Menber, Y. Wassihun, P. Petrucka, and N. Fentahun, "Determinants of growth monitoring and promotion service utilization among children 0–23 months of age in northern Ethiopia: unmatched case-control study," *BMC Nutr.*, vol. 7, no. 1, 2021, doi:

18

10.1186/s40795-021-00470-y.

[22] M. Tekle, B. Tariku, A. Alagaw, E. Zerihun, and H. W. Bekele, "Exploring Reasons for Low Attendance of Mothers to Growth Monitoring and Promotion Program at Loka Abaya District, Southern Ethiopia: Exploratory Qualitative Study," *J. Nutr. Metab.*, vol. 2019, pp. 6–7, 2019, doi: 10.1155/2019/3510649.

[23] M. Faber, M. A. S. Phungula, J. D. Kvalsvig, and A. J. S. Benadé, "Acceptability of community-based growth monitoring in a rural village in South Africa," *Food Nutr. Bull.*, vol. 24, no. 4, pp. 350–359, 2003, doi: 10.1177/156482650302400405.

[24] T. G. Gebrehiwot *et al.*, "Prevalence and associated factors of early postnatal care service use among mothers who had given birth within the last 12 months in Adigrat town, Tigray, northern Ethiopia, 2018," *Int. J. Womens. Health*, vol. 12, pp. 869–879, 2020, doi: 10.2147/IJWH.S266248.

[25] F. Seidu, "Utilisation of Growth Monitoring and Promotion is Highest Among Children Aged 0-11 Months : A Survey Among Mother-Child Pairs From Rural."

[26] Jane Ilusa Nyabuti(Kenyatta University, "Factors associated with the continuation of growth monitoring among children 10 to 59 months old," vol. 1, pp. 5–6, 2015.

[27] K. Lucy Mwari, M. N. Keraka Professor, K. University, and K. A. Jemimah Simbauni, "Care Giver Deteminants Of Utilization Of Growth Monitoring Clinic Among Children Aged 12-59 Months In Urban Kiambu County, Kenya," *Int. J. Innov. Res. Adv. Stud.*, vol. 4, no. 6, pp. 334–338, 2017.

19

BMJ Paediatrics Open

Utilization of Growth Monitoring and Promotion Service and Associated Factors among Mothers of Children Aged 0-23 Months Old in Mettu Town, South West Ethiopia

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

BMJ

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Original Research Artcle

Utilization of Growth Monitoring and Promotion Service and Associated Factors among Mothers of Children Aged 0-23 Months Old in Mettu Town, South West Ethiopia

Yohannes Tufa[1], Abeza Mitiku[2], Shuayib Shemsu[2], Kebebe Bidira[3]

[1] Department of Health Exension Service , Mettu Health Science College, Mettu, Ethiopia

[2] Department of Public Health, College of Health Science, Mettu University, Mettu, Ethiopia

[3] Department of Nursing , College of Health Science, Mettu University, Mettu, Ethiopia

Correspondence should be addressed to Abeza Mitiku ; abzmtk@gmail.com

Abstract

Background: Growth monitoring and promotion (GMP) is a preventive activity comprised of growth monitoring (GM) that serves as the core activity in an integrated child health and nutrition program. In most developing nations, including Ethiopia, however, the use of growth monitoring and promotion services is insufficient.Hence, the purpose of this study was to evaluate the use of GMP services and associated characteristics among womens with children aged 0–23 in Mettu, Southwest Ethiopia.

Objective: To assess utilization of growth monitoring and promotion service and associated factors among mothers with children aged 0-23 months old in Mettu town, South West Ethiopia, 2021.

Method: A community-based cross-sectional study was conducted among 354 randomly selected mothers with children aged 0–23 months old from June 25 to July 27, 2021 in Mettu town. Epi-data version 4.6.0 was used to enter data, which was then exported to SPSS version 25 for analysis. Simple binary and multivariable logistic regression were performed to identify factors associated with GMP utilization.

Results: A total of 354 study participants were included in the study yielding a response rate of 95.2%. The proportion of GMP utilization was 25.2% [95% CI: 20.24-29.33]. In multivariable regression analysis, Age of index child 0-11months [AOR=1.58; (95% CI: 1.052, 3.713)], early-PNC [AOR=1.72; (95% CI=1.657, 6.467)], middle tertile wealth status [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile wealth status [AOR=0.073; (95% CI (0.013-0.874)],utilization of family health card [AOR=2.09; (95% CI; 1.384, 5.343)] and taking ≤ 30minutes to reach the nearest health facility [AOR=2.23; (95%CI: 2.061, 7.350)] were significantly associated with GMP service utilization.

1

Conclusion and recommendation: In this study, only one-fourth of mothers with children aged 0–23 months old were utilizing GMP services. GMP service utilization was found to be significantly associated with child age, early-PNC, wealth status, family health card, and time taking ≤ 30minutes to reach the nearest health facility. Hence, appropriate strategies that promote and encourage GMP service utilization should be designed .

Key words: Growth Monitoring, Utilization, Mettu town, Children Aged 0-23Months

1. Introduction

Growth monitoring is defined as the regular measurement, plotting, and interpreting of a child's growth on a regular basis in order to respond when abnormal growth is noticed, with the aim of improving the child's nutritional status. Improved nutritional status, increased utilization of health care services, and subsequently a reduction in mortality are the main potential advantages of growth monitoring and promotion [1-2].

The majority of growth monitoring and promotion services are provided in health institutions or in communities. The main advantages of growth monitoring are that it helps families and community workers to identify children with growth failure early, when it is easier to intervene [3–5].

Child growth and development is one of the major   public health is problems in low and middle income countries[6]. Poor child growth is attributed to a greater childhood mortality as a result of severe infections and increased susceptibility to common childhood illnesses, which account for the majority of deaths among children under the age of five[7]. Malnutrition is directly or indirectly responsible for about half of all childhood deaths worldwide [8]. In 2019, there were 149 million children under the age of five in the world. Out of those, 49 million were stunted, 17 million were severely wasted, and 40 million were overweight [9].

In Ethiopia,Child malnutrition is a serious public health concern . According to the Ethiopian Mini Demographic and Health Survey of 2019, 37% of children under the age of five were stunted, 21% were underweight, and 7% were wasted. Similarly, in the Oromia region, 35.6% of children were stunted, 16.1% were underweight, and 4.7% were wasted[10]. In terms of the country's economic losses, the estimated annual costs of child malnutrition are 55.5 billion Ethiopian birr (ETB), or 16.5% of GDP[11].

The most cost-effective method for tracking the challenging public health problem of malnutrition is through various preventive techniques, including GMP. This includes ensuring that all children who

2

were normal weight at birth remain in that range, and that those who were low weight at birth are quickly brought into a healthy growth range[3].

It is critical to promote and improve a child's health during the window of opportunity, that last from conception to the child's second birthday[12]. Despite the fact that GMP is one of the activities that the Ethiopian government is currently focusing on to combat child malnutrition, only a few mothers brought their children for this service [13,14]. Studies done in different parts of Ehioipia revealed that only 16.9-38.9% proportion of mothers were attending GMP service [14–19]. Lack of appropriate information about GMP service, lack of support from husbands, distance from the health facility, pastoral life style and cultural issues such as the fear of "evil eye" were factors contributed for ulilization of GMP service[17, 20].

The irregularity of the GMP session due to health extension work load, not recording the age and weight of the child accurately, the mother's wrong belief, and the skill gap of health extension workers were challenges of GMP utilization [17]. Since 2008, Ethiopia has adopted GMP as a nutrition-specific intervention, but utilization of growth monitoring and promotion services has been limited [13].

However, limited evidence is available on the level of utilization of the GMP services in Mettu town. Hence, this study is intended to find out how widely GMP services are being utilized and what factors have affected the program in Mettu town.

2. Materials and Methods

2.1. Study area and period

The study was conducted in Mettu town from June 25 to July 27, 2021, which is located in I/A/Bor Zone, Oromia region, South West Ethiopia and is 542 km from Addis Ababa, the capital city of Ethiopia. Mettu is a market town with six administrative kebeles. One health center, one specialized hospital, and three health posts are found in the town. The total population of the town is estimated to be 49,538. The under five and under two age groups were estimated to be 8,139 and 2,828 respectively.

2.2. Study design and Population

Community-based cross-sectional study was employed from June 25to July 27/2021. All mothers who have children aged 0-23 months old and live in Mettu town were the source population ,whereas

3

mothers who have children aged 0-23 and selected by simple random sampling from the sampling frame were the study population and included in the study.

2.3 Eligibilty Criteria

Inclusion Criteria : Mothers with children aged 0-23 months old who have lived in Mettu town for at least 6 months were included in the study.

Exclusion Criteria :Mothers who were unable to respond due to medical or psychiatric illness were excluded.

2.4. Sample size Determination

The minimum required sample size was calcualted using a double population proportion formula using Epi Info™ version 7 by considering the assumptions, (80%) power of the study, 95% confidence level, 1:1 ratio and proportion of outcome for the variable, place of delivery (33.33% exposed and 10.33% non-exposed). After adding a **10%** non- response rate the final sample size for the study was **372**(table 1).

S/N	Variable	Assumptions						Sample size	Reference
		CI (%)	Power (%)	Ratio	AOR	Proportion of outcome			
						Exposed	Non exposed		
1.	Place of delivery	95	80	1:1	3.0	33.33%	10.33%	372	[18]
2.	Family health card	95	80	1:1	5.09	57.86%	11.14%	139	[20]
3.	Distance from near by health facility	95	80	1:1	4.53	33.90%	8.0%	359	[19]

Table 1: Sample size determination to assesse the utilization of GMP among mothers of children aged 0-23 months old in Mettu town, South West Ethiopia 2021.

2.5 Sampling techniques and procedures

All six urban kebeles were included in the study to achieve the desired sample size. Initially, a sampling frame containing a list of 2,828 containing mothers-child pairs aged 0-23 months old along with child's date of birth and house number was obtained from the respective health posts. Then samples representing each kebele were calculated using proportion to population size allocation.

4

Finally, a simple random sampling technique was employed using computer generated program (Microsoft-excel) to select a total of 372 samples from the six urban kebeles.

2.6 Data collection procedures and tools

Data were collected from mothers using a semi-structured interviewer administered questionnaire. The questionnaire was adapted from previous similar studies [17,20,22]. The questionnaire was first prepared in English and then translated to Afan Oromo and back to English to check the consistency by an expert who had good ability in both languages. The questionnaire was divided into five sections: socio-demographic and economic information; child and maternal health characteristics and mother-child feeding knowledge; maternal knowledge of the WHO growth chart and GMP service; and the availability and accessibility of health services.

Data was collected by six Dippoloma clinical nurses and two BSc nurses were recruited as supervisors during data collection. The younger child from the household was taken as an index child, and if twin children were found within one household, data was taken from one of them using the lottery method. If an eligible mother was absent during the data collection period, a revisit was done three times, and mothers absent on the third visit were considered non-respondent.

2.7 Data quality control

Before data collection, the questionnaires were pretested on a 5% (20) sample size in another town, which was not part of the actual data collection area. Based on the pretest, some modifications, such as unclear or vague questions and wrong skip patterns, were corrected. Two days of training were given for data collectors and supervisors by the principal investigator on data collection tools, data collection techniques, approach to the interviews, and maintaining the privacy and confidentiality of the respondents. Every day after data collection, the questionnaires were reviewed and checked for completeness by the supervisors and the principal investigator..

2.8 Patient and public involvement

No patient involved in this study.

2.9 Operational definition

 ✓ **GMP Utilization:** If mother participated in the GMP services at least once for 0 month old child, at least two times for 1-3 months old child, at least five times for 4-11 months and at

5

least four times per year for 12-23 months old child. In addition, it should be plotted or recorded on the child growth chart [18,23].

✓ **Family health card utilization:** The mother is considered to have utilized the family health card if she had the cards at home, plotted and able to interpret information displayed on the weight for age child growth chart during every GMP session.

✓ **Early Postnatal care:** is the care given to the women and her new-borns at least once from the second days through seventh days after delivery [24]

✓ **Family health card:** is book which contains the weight for age child growth chart for both sexes and used to plot the growth pattern of the child attending GMP session and would to be held by the mother.

✓ **Wealth index**: it is measured using fixed household asset. Factor score was derived using PCA (Principal Component Analysis) then the composite score was ranked in to three tertiles [25]

2.10 Data processing and analysis

All data were checked visually, coded, and entered into Epi-data version 4.6.0 and exported into SPSS version 25 software packages for analysis. Descriptive statistics (frequency and cross tabulation) were calculated for variables. The results were presented in the form of tables and text using frequencies and summary statistics such as mean, standard deviation, and percentage to describe the study population with relevant variables.

Before performing Principal Component Analysis (PCA) for variables explaining the household wealth index, all the necessary assumptions and prerequisites were checked. The degree of association between independent and dependent variables was assessed using odds ratio with 95% confidence interval. A simple binary logistic regression analysis was performed to select candidate variables for multivariable regression analysis. Variables with p-value<0.25 were taken as cut-off point to select eligible variables for the multivariable regression analysis and p-value<0.05 was declared as statistically significant in the final model.

Pseudo regression was performed to check multi-collinearity between independent variables. The minimum tolerance and maximum variance inflation factor (VIF) were found to be 0.80 and 1.89 respectively. For the finally fitted multivariable logistic regression model, the adequacy of the model to predict the outcome variables was checked by Hosmer-Lemeshow goodness-of-fit and p-value>0.05.

6

3. RESULT

3.1. Socio-demographic and economic characteristics of households.

In this study, a total of 354 mother-child pairs were included, yielding a response rate of 95.2%. The mean age (month) of the children was 11.25(6.433) and more than half the children, 187(52.8%), belonged to the age category below 11 months. Regarding the age of respondents, the majority 329,(92.9%) of them were in the age category below 30. The mean age (year) of the mothers was 24.91(3.472). More than half of the respondents 181(51.2%) attended secondary and above education . Nearly half 160(45.3%) of the respondents were housewives. In-terms of wealth status , 116(32.8%) and 93(26.2%) ranked in the higher and lower tertiles, respectively **(Table 2)**

Table 2:Demographic and socio-economic characteristics of mothers with children aged 0-23months, Mettu town, 2021. (n=354)

Variable	Categories	Frequency	Percentage
Sex of the child	Male	184	51.98
	Female	170	48.02
Age of a child/months	0-11	187	52.8
	12-23	167	47.2
Maternal Age	<30	329	92.9
	≥30	25	7.1
Religion of mother	Orthodox	136	38.5
	Muslim	111	31.4
	Protestant	96	27
	Others*	11	3.1
Ethnicity of Mother	Oromo	289	81.7
	Amhara	36	10.1
	Gurage	14	4.00
	Others**	15	4.20
	No formal education	32	9.0
Level of education	Primary	141	39.8
	Secondary and above	181	51.2
	House wife	160	45.3
Occupational status	Merchant	36	10.2
	Government employee	53	14.9
	Private employee	48	13.7
	Student	39	10.9
	Others***	18	4.97

7

Current marital status	Married	321	90.7
	Single	20	5.6
	Divorced	11	3.1
	Widowed	2	0.6
Family size	<3	96	27.2
	4-5	165	46.5
	>5	93	26.3
Wealth status	Lower tertile	93	26.2
	Middle tertile	145	41.0
	Higher tertile	116	32.8

*Catholic, Wakefata, &Jiohava   **Kambata, Hadiya, Tigre, Agnuak&Nuer ***Daily labourer

3.2. Information on availability of health facility with specific health services

In this study, nearly half 168(47.5%) of the study participants took thirty minutes or less to reach the nearest health facility. More than two-thirds (272(76.7%) of respondents prefer to go to health centres for their children's care. Regarding the perceived awareness of the respondents to the availability of GMP services, half of 187 (52.8%) of the respondents were aware of the availability of GMP services at health facilities **(Table 3).**

Table 3: Information on availability and accessibility of health services among mother-child pair, Mettu town, 2021. (n=354)

Variable	Category		Frequency	Percentage
Time it takes to the nearest health facility	≤30minutes		168	47.5
	>30minutes		186	52.5
The most frequently visited health facility for child care.	Health centre		272	76.7
	Health post		9	2.5
	Private clinic		51	14.3
	Hospital		23	6.5
Perceived awareness on availability of specific health Services	ANC	Yes	318	89.8
		No	36	10.2
	Delivery	Yes	301	85.1
		No	53	14.9
	PNC	Yes	242	68.3
		No	112	31.7
	GMP	Yes	187	52.8

8

| | | No | 167 | 47.2 |

3.3. Information on utilization of maternal and child health service

Among 354 mothers who participated in this study, more than half 181 (55.5%) the mothers had ANC follow-up with a frequency of visits of four or more. The majority of the mothers 334(94.4%) delivered at health institutions, but only one third 123(34.8%) of the mothers had an early PNC. **(Table 4)**
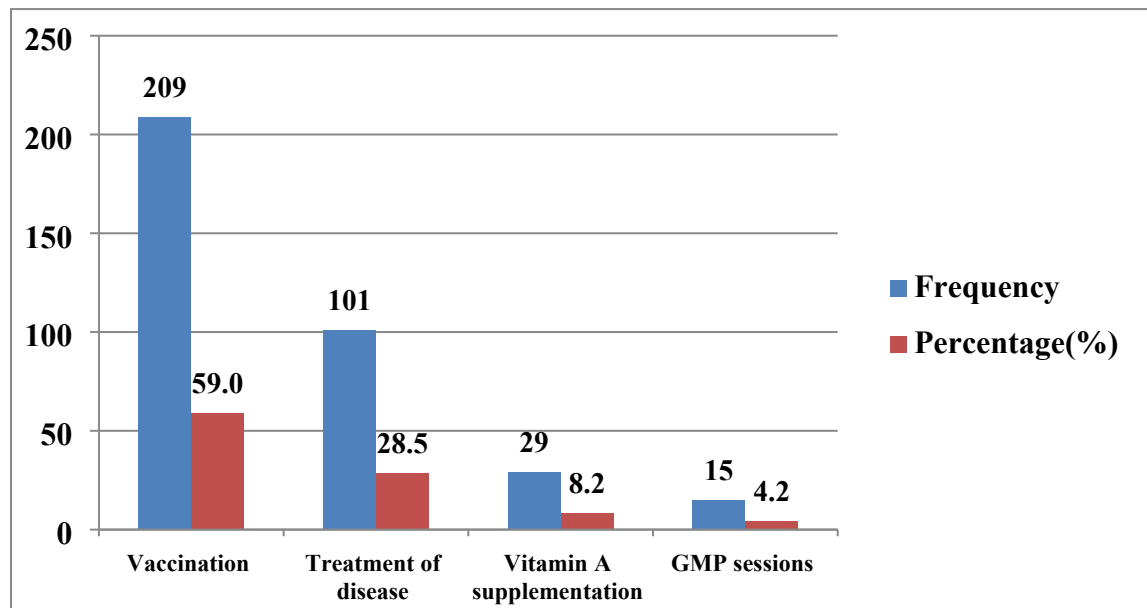
Table 4: Variables used to assess the information on MCH service among mothers and their children, Mettu, Ethiopia, 2021 (n=354)

Variable	Category	Frequency	Percentage
ANC follow-up	No	25	7.1
	Yes	329	92.9
Frequency of ANC follow-up	<4 visits	147	44.8
	≥ 4 visits	181	55.5
Place of delivery	Home	20	5.6
	Health institution	334	94.4
Early-PNC	No	231	65.2
	Yes	123	34.8
Vaccination status of the child	Not vaccinated	9	2.5
	Vaccinating	137	38.8
	Defaulter	6	1.6
	Fully vaccinated	202	57.1
Reason for not vaccinated	Distance to EPI sites	1	12.5
	Do not know the benefit	8	87.5

3.4. Reasons for frequent health facility visits by Mothers

This study revealed that nearly two-thirds 209(59.0%) of the mothers frequently visit health facilities to have their children vaccinated, but only 15(4.3%) of the mothers who participated in the study took their children for weighing or GMP service. **(Figure 3)**

9

Figure 1: Mothers most common reason to visit health facility, Mettu town, 2021. (n=354)

3.5. Child feeding and growth monitoring knowledge of Mothers

The finding of this study reported that, majority of the respondents 310(87.6%) were counselled on child feeding. Almost all respondents 347(98.1%) were provided breast milk to their babies immediately after birth. Nearly half 166(46.9%) of the study participants were utilizing family health cards, and the majority (153(92.05%) of those utilizing mothers were able to read and interpret information displayed on the growth chart **(Table 5)**

Table 5:Child feeding and growth chart knowledge of mothers, Mettu town, 2021. (n=354)

Variable	Category	Frequency	Percentage
Counselled by HCWs on child feeding	No	44	12.4
	Yes	310	87.6
The first thing given after birth	Breast milk	347	98.1
	Other*	7	1.86
Time for BF initiation immediately after birth	Within 1hr	342	96.7
	Greater than1hr	11	3.1
Duration of EBF	3 months	7	1.9
	6 months	344	97.2
	1 year	3	0.9
Total duration of BF	Below 2year	33	9.33

10

	2year and greater	321	90.68
Do utilize family health card at home.	No	188	53.1
	Yes	166	46.9
Can you read information displayed on growth chart	No	13	7.95
	Yes	153	92.05
Who thought you	HCWs	99	64.95
	By my self	46	30.01
	HEWs	8	5.04
What does it mean if growth curve flattens	Child not growing well	72	46.8
	Child may be sick	31	20.3
	Child not eating well	50	32.9
What does it mean if growth curve rising	Child gaining weight	89	58.4
	Child is healthy	16	10.6
	Child is eating well	48	31.0
What does it mean, if growth curve is falling	Child is not gaining weight	66	43.2
	Child may be sick or has been sick	36	23.4
	Child is not eating well	51	33.4

Other* Formula milk, water, cow milk

3.6. Utilization of GMP services

This study revealed that one-fourth of 89(25.2%) mothers utilized GMP service with [95% CI 20.24–29.33]. Of those respondents who participated in this study, nearly two-thirds 196 (60.9%) knew the benefit of GMP. Regarding the benefits of the GMP service, Half 108(50.5%) of the respondents reported the GMP service is used "to monitor the child's growth." More than two-thirds 59(66.7%) of the respondents followed GMP sessions at health centres.**(Table 6)**

Table 6: Variables to assess utilization of GMP, Mettu town, 2021. (n=354)

Variable	Category	Frequency	Percentage
GMP utilization status			
	Utilized	89	25.2
	Not utilized	265	74.8

11

Know benefit of regular GMP session	Yes	216	60.9
	No	138	29.1
Benefit of regularly taking the child for GMP session	To monitor growth	108	50.0
	To seek medical care	7	3.06
	To know health status	101	46.94
Place where GMP given	Health centre	59	66.7
	EPI outreach sites	8	8.45
	Health posts	22	24.85
Who provides the service	HEWs	30	33.15
	HCWs	59	66.8

3.6.1 Reasons for not taking the child for GMP session

This study reported that, more than one-thirds 135(38.2%) of the respondents who missed taking the child for GMP sessions didn't know the benefits of the GMP services, and 102(28.9%) of the mothers lacked information about the services. **(Figure 4)**
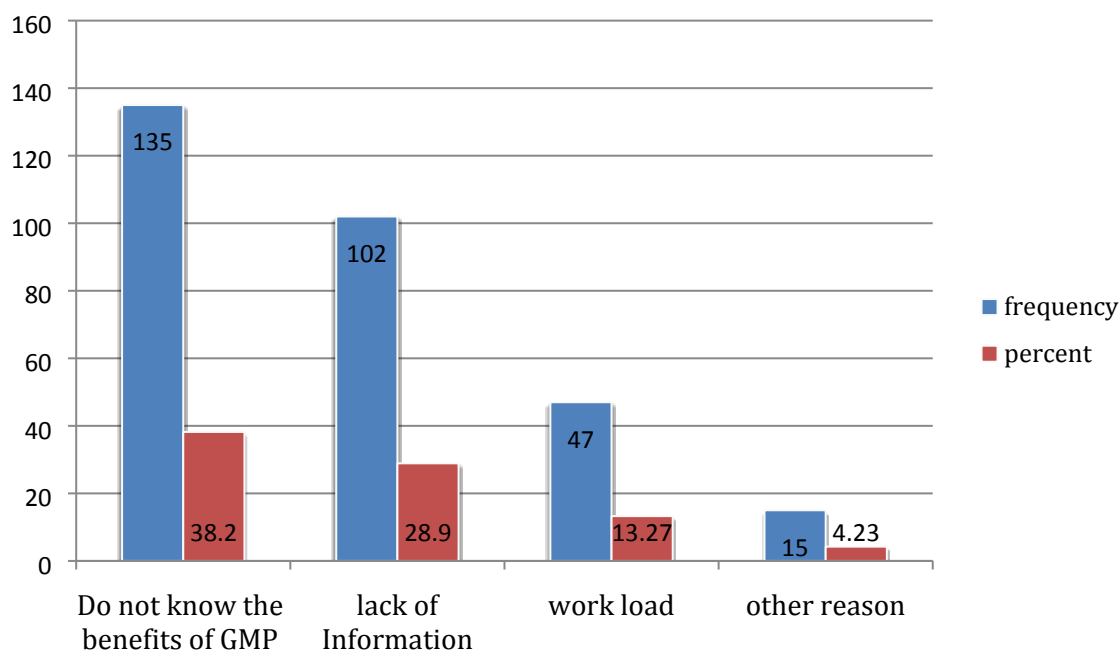
Figure 2: Reasons for not regularly taking the child for GMP session, Mettu town, 2021. (n=354)

3.7. Factors associated with GMP service utilization

On multivariable logistic regression analysis, mothers with children aged 0-11 months old [AOR=1.58; (95% CI:(1.052, 3.713)], Mothers who had early-PNC [AOR=1.72; (95% CI :(1.657, 6.467)], mothers from households with middle and [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile [AOR=0.073; (95% CI (0.013-0.874)], mothers utilizing family health card at home [AOR=2.09; (95% CI; 1.384, 5.343)]. Mothers who took thirty minutes and below to reach the nearest health facility [AOR=2.24; (95%CI: 2.061, 7.350)] were factors significantly associated with utilization of GMP **(Table 7)**

Table 7: Bi-variable and multi-variable logistic regression analysis of GMP utilization among mothers of children aged 0-23months in Mettu town, 2021. (n=354)

Variable	Category	Utilization of GMP		95% CI	
		Yes(%)	No(%)	COR	AOR
Age of index child	12-23months	32(9.01)	135(38.2)	1	1
	≤11months	57(16.15)	130(36.6)	1.87(1.112-3.143)	**1.58(1.052-3.713)****
Frequency of ANC visit	<4	28(7.91)	107(30.22)	1	
	≥4	61(17.23)	110(31.07)	2.12(1.204-3.519)	1.16(0.579-2.305)
Early-PNC	No	46(13.04)	185(52.2)	1	
	Yes	43(12.1)	80(22.7)	2.14(1.277-3.577)	**1.72(1.657-6.467)****
Maternal level of education	No formal education	6(1.60)	26(7.40)	1	
	Primary	27(7.51)	114(32.25)	1.17(0.404-3.356)	0.645(0.179-2.320)
	Secondary and above	56(15.8)	125(35.4)	2.15(0.775-5.946)	0.319(0.088-1.160)
Wealth status	Higher tertile	62(17.5)	54(15.25)	**1**	**1**
	Middle tertile	17(4.80)	128(36.16)	0.116(0.016-0.311)	**0.108(0.047-0.319)****
	Lower tertile	10(2.82)	83(23.45)	0.099(0.012-0.697)	**0.073(0.013-0.874)****
Family health card utilization	No	33(9.31)	155(43.8)	1	
	Yes	56(15.8)	110(31.1)	2.40(1.427-4.027)	**2.09(1.384-5.343)****
Perceived awareness on	No	27(7.76)	133(37.6)	1	
	Yes	62(17.4)	132(37.3)	2.26(1.323-3.858)	1.67(0.871-3.203)

13

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

GMP availability

Time to reach nearby health facility	>30minutes	31(8.76)	155(43.78)	1	
	≤ 30minutes	58(16.38)	110(31.07)	2.64(2.410-7.297)	**2.23(2.061-7.350)****

Note: ** denote statistically significant variables in multivariable logistic regression at *p-value* <0.05, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

4. DISCUSSION

GMP services are essential until the child's second birthday in order to have a healthy and well-nourished child and to break the intergenerational cycle of malnutrition. Hence, this study was aimed to assess utilization of growth monitoring and promotion services and associated factors among mothers of children aged 0–23 months old in Mettu town. The proportion of GMP service utilization in this study area was found to be 25.2% with [95% CI: 20.24.-29.33]. This finding is comparable with a study conducted in rural lower part of Ghana 28.5% and Northern Ethiopia 30.7%[20,26].

The finding of this study is lower compared to a study conducted in Lawra district of Ghana 70% and Nyamira country of Kenya 53.3%[16, 27]. The inconsistency might be due to, differences in socio-economic characteristics among study population, study design and study period.

However, the finding of the current study was higher compared to a study done in Thika sub-city of Kenya 20%, Mareka district, southern Ethiopia, 16.9% and Butajira District, southern Ethiopia,11%[17-18, 28]. The possible justification for the discrepancy might be differences in study setting, socio-economic and demographic characteristic among study participants and study period.

The age of the index child was found to be significantly associated with the utilization of growth monitoring and promotion services. Mothers with index children below 11 months were 1.5 times more likely to utilize GMP compared to mothers with index children aged 12–23 months old. The possible explanation might be that children below 11 months old are recommended to go for several doses of immunization. Thus, most mothers will continue to send them to weighing centers until completion of the immunization. However, as the child's age advances, attendance at GMP sessions decreases. This finding is similar to a study conducted in rural Ghana, which discovered a negative correlation between child age and GMP utilization [26]. In contrast to this finding, a study conducted in the Legambo districts of South Wollo zone and Mareka found that mothers with index children aged 12-24 months were more likely to utilize GMP services than those aged 11 months or less.[18-

14

19]. The inconsistency might be due to the differences in study design and sampling technique employed. The study conducted in Legambo district used an unmatched case-control study design, which may have contributed to this variation.

This study found that mothers who had early-PNC were 1.7 times more likely to utilize growth monitoring and promotion services compared to those mothers who had no early-PNC. This relationship between eraly PNC service and the higher utilization of GMP could be explained by the child nutrition and health counselling that provided as the part of PNC service. As a result, they could get more opportunities to receive child growth and development counseling. This study is supported by the study conducted in Benin that reported mothers who had early PNC were more likely to utilize maternal and child health services[29] .

Utilization of family health cards was another predictor of growth monitoring and promotion services in this study. Those mothers utilizing family health cards were 2 times more likely to utilize growth monitoring and promotion services compared to those who were not. This might be due to the possibility of family health cards motivating mothers to get GMP service. This finding congruent with a study done in Yilmana woreda of northern Ethiopia [20].

Compared to those mothers from households with higher tertile wealth status, mothers from households with lower and middle tertile wealth status were 89% and 92% less likely to utilize GMP services respectively. The study done in Southern Ethiopia supports this finding[18]. The posiible explanation could be that people with lower household tertile might be busy fulfilling their day-to-day livelihood needs and have limited time to attend the GMP service.

The time it takes to reach a nearby health facility was found to be significantly associated with GMP service utilization. Those mothers who took less than 30 minutes to reach a nearby health facility were 2 times morw likely to utilize GMP than those mothers who took more than 30 minutes to reach a nearby health facility. This finding was in line with the studies conducted in Yilmana Dedisa and Butajira district [17,20]. This could be because mothers who live near a health facility can bring their children for GMP service quickly and return to work, even if they are busy at work.

4.1. Strength and Limitation of the study

There are certain limitations to this research. First, since the data was collected by the verbal report of the participants, there might be a possibility of response bias. To reduce response bias, the data collectors were

15

trained on some techniques such as not judging the participants for their responses, asking neutrally and avoiding leading questions during the interview. Second, the study did not assess the qualitative perspective of GMP utilization.

5. Conclusions and Recommendation

The study found that only one-fourth of mothers with children aged 0-23 months in Mettu town were utilizing GMP services. Ages of index child, early-PNC, utilizing family health card, wealth status, and time to reach nearby health facility were significantly associated with GMP service utilization. Hence, appropriate strategies that promote and encourage the GMP service utilization should be designed .

Abbreviation

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; CI: Confidence Interval, GMP: Growth Monitoring and Promotion , HEW: Health Extension Worker, ANC: Antenatal Care, PNC: Postnatal Care, NNP: National Nutrition Program.

Authors' contributions

YT; developed the research idea, design, analysis, and drafted the manuscript. AM, SHSH, and KB conceived the study, supervised the data collectors, interpret the result and reviewed the manuscript. All authors read and approved the final manuscript. YT is responsible for the overall content as guarantor.

Data Availability

The data sets analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval and Consent to Participate

 Ethical clearance was obtained from the ethical review board of Mettu University, College of Health Science (Ref.No.RPG 42/20) submitted to Mettu town health office. The letter of permission was

obtained from Mettu town health office. Before beginning the data collection, written consent was obtained from the study participants, after clear information was provided about the objectives of the study. The study was conducted in accordance with the Helsinki Declaration.

Conflict of Interest

The authors declare that they have no competing interests regarding the publication of this article.

REFERENCES

[1]   P. Garner, R. Panpanich, and S. Logan, "Is routine growth monitoring effective? A systematic review of trials... including commentary by Davies DP.," *Arch. Dis. Child.*, vol. 82, no. 3, pp. 197–201, 2000, [Online]. Available: http://www.epistemonikos.org/documents/e2b62e1929a334513c1b4fd795155729f2284025.

[2]   A. Ashworth, R. Shrimpton, and K. Jamil, "Growth monitoring and promotion: Review of evidence of impact," *Matern. Child Nutr.*, vol. 4, no. SUPPL.1, pp. 86–117, 2008, doi: 10.1111/j.1740-8709.2007.00125.x.

[3]   M. Griffiths and J. Del Rosso, "GROWTH MONITORING AND THE PROMOTION OF HEALTHY YOUNG CHILD GROWTH: Evidence of Effectiveness and Potential to Prevent Malnutrition," *Matern. Child Nutr.*, no. November, pp. 86–117, 2008.

[4]   UNICEF, "Experts ' consultation on growth monitoring and promotion strategies : Program guidance for a way forward Recommendations from a Technical Consultation UNICEF Headquarters New York , USA," pp. 1–8, 2008.

[5]   N. Mangasaryan, M. Arabi, and W. Schultink, "Revisiting the concept of growth monitoring and its possible role in community-based nutrition programs," *Food Nutr. Bull.*, vol. 32, no. 1, pp. 42–53, 2011, doi: 10.1177/156482651103200105.

[6]   C. Lu, M. M. Black, and L. M. Richter, "Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level," *Lancet Glob. Heal.*, vol. 4, no. 12, pp. e916–e922, 2016, doi: 10.1016/S2214-109X(16)30266-2.

[7]   UNICEF, *Tracking Progress on Child and Maternal Nutrition*. 2009.

[8]   Unicef, World Health Organization, and T. W. Bank, "Levels and Trends in Child malnutrition. Key findings of the 2018 edition," *Midwifery*, pp. 1–6, 2018.

[9]   U. Who and W. Bank, "Levels and trends in child malnutrition," 2019.

[10]   M. Demographic, H. Survey, and K. Indicators, *Mini Demographic and Health Survey*. 2019.

[11]   arican development bank and agance frace development Wfp, "The Cost of hunger in Africa:

17

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Ethiopia WFP," 2014.

[12] T. H. E. Foundation and F. O. R. Development, "INVESTING IN NUTRITION," 2015.

[13] N. P. Planning, F. Health, and A. P. Managers, "Nutrition Program Planning and Supervision : For Health and Agriculture Program Managers Reference Manual July 2013 Nutrition Program Planning and Supervision : For Health and Agriculture Program Managers Reference Manual," no. July, 2013.

[14] A. Yeshaneh, T. Fentahun, T. Belachew, A. Mohammed, and D. Adane, "Utilization of growth monitoring and promotion services and associated factors among children aged 0-23 months in Banja District, Northwest Ethiopia 2020: A crosssectional study," *PLoS One*, vol. 16, no. 11 November 2021, pp. 1–14, 2021, doi: 10.1371/journal.pone.0259968.

[15] S. M. Bilal, A. Moser, R. Blanco, M. Spigt, and G. J. Dinant, "Practices and challenges of growth monitoring and promotion in Ethiopia: A qualitative study," *J. Heal. Popul. Nutr.*, vol. 32, no. 3, pp. 441–451, 2014.

[16] D. Tuobom Debuo, "Caregivers Knowledge, Attitude and Practices on Child Growth Monitoring and Promotion Activities in Lawra District, Upper West Region of Ghana," *Sci. J. Public Heal.*, vol. 5, no. 1, p. 20, 2017, doi: 10.11648/j.sjph.20170501.13.

[17] L. Desalegne, S. Shiferaw, D. Haile, and T. Submitted, "Assessment of Knowledge and Utilization of Growth Monitoring and Promotion for under two children in Butajira, Ethiopia 2017," no. June, 2017.

[18] F. W. Feleke, A. A. Adole, and A. M. Bezabih, "Utilization of growth monitoring and promotion services and associated factors among under two years of age children in Southern Ethiopia," *PLoS One*, vol. 12, no. 5, pp. 1–9, 2017, doi: 10.1371/journal.pone.0177502.

[19] S. Dagne, "Determinants of Growth Monitoring and Promotion Service Utilization Among Children 0-23 Months of Age in Northern Ethiopia : Unmatched Case Control Study," *Res. Sq.*, vol. 1, pp. 15–20, 2020.

[20] S. Yeniew, "Utilization of Growth Monitoring and Promotion Service By Mothers of Children 0-23 Months Old in Yilmana Denisa Woreda ," 2020.

[21] S. Dagne, J. Aliyu, Y. Menber, Y. Wassihun, P. Petrucka, and N. Fentahun, "Determinants of growth monitoring and promotion service utilization among children 0–23 months of age in northern Ethiopia: unmatched case-control study," *BMC Nutr.*, vol. 7, no. 1, 2021, doi: 10.1186/s40795-021-00470-y.

[22] M. Tekle, B. Tariku, A. Alagaw, E. Zerihun, and H. W. Bekele, "Exploring Reasons for Low Attendance of Mothers to Growth Monitoring and Promotion Program at Loka Abaya District,

18

Southern Ethiopia: Exploratory Qualitative Study," *J. Nutr. Metab.*, vol. 2019, pp. 6–7, 2019, doi: 10.1155/2019/3510649.

[23] M. Faber, M. A. S. Phungula, J. D. Kvalsvig, and A. J. S. Benadé, "Acceptability of community-based growth monitoring in a rural village in South Africa," *Food Nutr. Bull.*, vol. 24, no. 4, pp. 350–359, 2003, doi: 10.1177/156482650302400405.

[24] T. G. Gebrehiwot *et al.*, "Prevalence and associated factors of early postnatal care service use among mothers who had given birth within the last 12 months in Adigrat town, Tigray, northern Ethiopia, 2018," *Int. J. Womens. Health*, vol. 12, pp. 869–879, 2020, doi: 10.2147/IJWH.S266248.

[25] EDHS, *FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA Demographic and Health Survey*. 2016.

[26] F. Seidu, "Utilisation of Growth Monitoring and Promotion is Highest Among Children Aged 0-11 Months : A Survey Among Mother-Child Pairs From Rural."

[27] Jane Ilusa Nyabuti(Kenyatta University, "Factors associated with the continuation of growth monitoring among children 10 to 59 months old," vol. 1, pp. 5–6, 2015.

[28] K. Lucy Mwari, M. N. Keraka Professor, K. University, and K. A. Jemimah Simbauni, "Care Giver Deteminants Of Utilization Of Growth Monitoring Clinic Among Children Aged 12-59 Months In Urban Kiambu County, Kenya," *Int. J. Innov. Res. Adv. Stud.*, vol. 4, no. 6, pp. 334–338, 2017.

[29] E. Budu *et al.*, "Maternal healthcare utilization and full immunization coverage among 12–23 months children in Benin: a cross sectional study using population-based data," *Arch. Public Heal.*, vol. 79, no. 1, pp. 1–12, 2021, doi: 10.1186/s13690-021-00554-y.

BMJ Paediatrics Open

Utilization of Growth Monitoring and Promotion Service and Associated Factors among Mothers of Children Aged 0-23 Months Old in Mettu Town, South West Ethiopia

SCHOLARONE™
Manuscripts

BMJ

Original Research Artcle

Utilization of Growth Monitoring Service by Mothers of Infants in Mettu Town, South West Ethiopia

Yohannes Tufa[1], Abeza Mitiku[2], Shuayib Shemsu[2], Kebebe Bidira[3]

[1] Department of Health Exension Service, Mettu Health Science College, Mettu, Ethiopia

[2] Department of Public Health, College of Health Science, Mettu University, Mettu, Ethiopia

[3] Department of Nursing , College of Health Science, Mettu University, Mettu, Ethiopia

Correspondence should be addressed to Abeza Mitiku ; abzmtk@gmail.com

Abstract

Background: Growth monitoring (GM) is a preventive activity that serves as the core function in an integrated child health and nutrition program. In most developing nations, including Ethiopia, however, the use of growth monitoring and promotion services is insufficient. Hence, the purpose of this study was to evaluate the use of GM services and associated characteristics among mother of infants in Mettu town, Southwest Ethiopia.

Objective: To assess the utilization of growth monitoring service by mothers of infants in Mettu town, Southwest Ethiopia, 2021.

Method: A community-based cross-sectional study was conducted among 354 randomly selected mothers with children aged 0–23 months old from June 25 to July 27, 2021 in Mettu town. Epi-data version 4.6.0 was used to enter data, which was then exported to SPSS version 25 for analysis. Simple binary and multivariable logistic regression were performed to identify factors associated with GM service utilization.

Results: A total of 354 study participants were included in the study yielding a response rate of 95.2%. The proportion of GM service utilization was 25.2% [95% CI: 20.24-29.33]. In multivariable regression analysis, Age of index child 0-11months [AOR(Adjusted Odds Ratio)=1.58; (95% CI: 1.052, 3.713)], early-PNC (Postnatal Care) [AOR=1.72; (95% CI=1.657, 6.467)], middle tertile wealth status [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile wealth status [AOR=0.073; (95% CI (0.013-0.874)],utilization of family health card [AOR=2.09; (95% CI; 1.384, 5.343)] and taking $\leq$ 30minutes to reach the nearest health facility [AOR=2.23; (95%CI: 2.061, 7.350)] were significantly associated with GM service utilization.

1

Conclusion and recommendation: In this study, only one-fourth of mothers with children aged 0–23 months old were utilizing GM services. GM service utilization was found to be significantly associated with child age, early-PNC visit, wealth status, utilization of family health card, and time taking ≤ 30minutes to reach the nearest health facility. Hence, appropriate strategies that promote and encourage GM service utilization should be designed .

Key words: Growth Monitoring, Utilization, Mettu town, Children Aged 0-23Months

1. Introduction

Growth monitoring is defined as the regular measurement, plotting, and interpreting of a child's growth on a regular basis in order to respond when abnormal growth is noticed, with the aim of improving the child's nutritional status. Improved nutritional status, increased utilization of health care services, and subsequently a reduction in mortality are the main potential advantages of growth monitoring service [1-2].

The majority of growth monitoring services are provided in health institutions or in communities. The main advantages of growth monitoring are that it helps families and community workers to identify children with growth failure early, when it is easier to intervene [3–5].

Child growth and development is one of the major public health is problems in low and middle income countries [6]. Poor child growth is attributed to a greater childhood mortality as a result of severe infections and increased susceptibility to common childhood illnesses, which account for the majority of deaths among children under the age of five [7]. Malnutrition is directly or indirectly responsible for about half of all childhood deaths worldwide [8]. In 2019, there were 149 million children under the age of five in the world. Out of those, 49 million were stunted, 17 million were severely wasted, and 40 million were overweight [9].

In Ethiopia, child malnutrition is a serious public health concern. According to the Ethiopian Mini Demographic and Health Survey of 2019, 37% of children under the age of five were stunted, 21% were underweight, and 7% were wasted. Similarly, in the Oromia region, 35.6% of children were stunted, 16.1% were underweight, and 4.7% were wasted [10]. In terms of the country's economic losses, the estimated annual cost of child malnutrition is 55.5 billion Ethiopian birr (ETB), or 16.5% of GDP [11].

The most cost-effective method for tracking the challenging public health problem of malnutrition is through various preventive techniques, including GMserive. This includes ensuring that all children

2

who were normal weight at birth remain in that range, and that those who were low weight at birth are quickly brought into a healthy growth range [3].

It is critical to promote and improve a child's health during the window of opportunitythat lasts from conception to the child's second birthday [12]. Despite the fact that GM is one of the activities that the Ethiopian government is currently focusing on to combat child malnutrition, only a few mothers brought their children for this service [13,14]. Studies done in different parts of Ethiopia revealed that only 16.9-38.9% of mothers were attending GM services [14–19]. Lack of appropriate information about GM service, lack of support from husbands, distance from the health facility, pastoral life style, and cultural issues such as the fear of "evil eye" were factors contributing to the ulilization of GM service [17, 20].

The irregularity of the GM session due to health extension work load, not recording the age and weight of the child accurately, the mother's wrong belief, and the skill gap of health extension workers were challenges to GM service utilization [17]. Since 2008, Ethiopia has adopted GM as a nutrition-specific intervention, but utilization of growth monitoring services has been limited [13]**.**

However, limited evidence is available on the level of utilization of the GM services in Mettu town. Hence, this study is intended to find out how widely GM services are being utilized and what factors have affected the program in Mettu town.

2. Materials and Methods

2.1. Study area and period

The study was conducted in Mettu town from June 25 to July 27, 2021, which is located in the I/A/Bor Zone, Oromia region, Southwest Ethiopia and is 542 km from Addis Ababa, the capital city of Ethiopia. Mettu is a market town with six administrative kebeles. One health center, one specialized hospital, and three health posts are found in the town. The total population of the town is estimated to be 49,538. The under five and under two age groups were estimated to be 8,139 and 2,828 respectively.

2.2. Study design and Population

A Community-based cross-sectional study was employed from June 25to July 27/2021. All mothers who have children aged 0-23 months old and live in Mettu town were the source population ,whereas

3

mothers who have children aged 0-23 and selected by simple random sampling from the sampling frame were the study population and included in the study.

2.3 Eligibilty Criteria

Inclusion Criteria : Mothers with children aged 0-23 months old who have lived in Mettu town for at least 6 months were included in the study.

Exclusion Criteria :Mothers who were unable to respond due to medical or psychiatric illness were excluded.

2.4. Sample size Determination

The minimum required sample size was calcualted using a double population proportion formula using Epi Info™ version 7 by considering the assumptions, (80%) power of the study, 95% confidence level, 1:1 ratio and proportion of outcome for the variable, place of delivery (33.33% exposed and 10.33% non-exposed). After adding a 10% non- response rate the final sample size for the study was **372**(table 1).

S/ N	Variable	Assumptions						Sample size	Reference
		CI (%)	Power (%)	Ratio	AOR	Proportion of outcome			
						Exposed	Non exposed		
1.	Place of delivery	95	80	1:1	3.0	33.33%	10.33%	372	[18]
2.	Family health card	95	80	1:1	5.09	57.86%	11.14%	139	[20]
3.	Distance from near by health facility	95	80	1:1	4.53	33.90%	8.0%	359	[19]

Table 1: Sample size determination to assesse the utilization of Growth Monitoring Service by Mothers of Infants in Mettu town, South west Ethiopia, 2021

2.5 Sampling techniques and procedures

To achieve the desired sample size, all six urban kebeles were included in the study.. Initially, a sampling frame containing a list of 2,828 containing mothers-child pairs aged 0-23 months old along with the child's date of birth and house number was obtained from the respective health posts. Then samples representing each kebele were calculated using a proportional to population size allocation.

4

Finally, a simple random sampling technique was employed using computer-generated program (Microsoft-excel) to select a total of 372 samples from the six urban kebeles.

2.6 Data collection procedures and tools

Data was collected from mothers using a semi-structured interviewer administered questionnaire. The questionnaire was adapted from previous similar studies [17,20,22]. The questionnaire was first prepared in English and then translated to Afan Oromo and back to English to check the consistency by an expert who had good ability in both languages. The questionnaire was divided into five sections: socio-demographic and economic information; child and maternal health characteristics and mother-child feeding knowledge; maternal knowledge of the WHO growth chart and GM service; and the availability and accessibility of health services.

Data was collected by six Diploma clinical nurses and two BSc nurses were recruited as supervisors during data collection. The younger child from the household was taken as an index child, and if twin children were found within one household, data was taken from one of them using the lottery method. If an eligible mother was absent during the data collection period, a revisit was done three times, and mothers absent on the third visit were considered non-respondent.

2.7 Data quality control

Before data collection, the questionnaires were pretested on a 5% (20) sample size in another town, which was not part of the actual data collection area. Based on the pretest, some modifications, such as unclear or vague questions and wrong skip patterns, were corrected. Two days of training were given for data collectors and supervisors by the principal investigator on data collection tools, data collection techniques, approach to the interviews, and maintaining the privacy and confidentiality of the respondents. Every day after data collection, the questionnaires were reviewed and checked for completeness by the supervisors and the principal investigator.

2.8 Patient and public involvement

No patient involved in this study.

2.9 Operational definition

- ✓ **GM Utilization:** If mother particpiated in the GM services at least once for 0 month old child, at least two times for 1-3 months old child, at least five times for 4-11 months and at

5

least four times per year for 12-23 months old child. In addition, it should be plotted or recorded on the child growth chart [18,23].

✓ **Family health card utilization:** The mother is considered to have utilized the family health card if she had the cards at home, plotted and able to interpret information displayed on the weight for age child growth chart during every GM session.

✓ **Early Postnatal care:** is the care given to the women and her new-borns at least once from the second days through seventh days after delivery [24]**.**

✓ **Family health card:** is book which contains the weight for age child growth chart for both sexes and used to plot the growth pattern of the child attending GM session and would to be held by the mother.

✓ **Wealth index**: it is measured using fixed household asset. Factor score was derived using PCA (Principal Component Analysis) then the composite score was ranked in to three tertiles [25].

2.10 Data processing and analysis

All data were checked visually, coded, and entered into Epi-data version 4.6.0 before being exported to SPSS version 25 for analysis. Descriptive statistics (frequency and cross- tabulation) were calculated for variables. The results were presented in the form of tables and text using frequencies and summary statistics such as mean, standard deviation, and percentage to describe the study population with relevant variables.

Before performing Principal Component Analysis (PCA) for variables explaining the household wealth index, all the necessary assumptions and prerequisites were checked. The degree of association between independent and dependent variables was assessed using an odds ratio with a 95% confidence interval. A simple binary logistic regression analysis was performed to select candidate variables for multivariable regression analysis. Variables with p-value<0.25 were taken as a cut-off point to select eligible variables for the multivariable regression analysis, and a p-value<0.05 was declared as statistically significant in the final model.

Pseudo regression was performed to check multi-collinearity between independent variables. The minimum tolerance and maximum variance inflation factor (VIF) were found to be 0.80 and 1.89, respectively. For the finally fitted multivariable logistic regression model, the adequacy of the model to predict the outcome variables was checked by Hosmer-Lemeshow goodness-of-fit and p-value>0.05.

6

3. RESULT

3.1. Socio-demographic and economic characteristics of households

In this study, a total of 354 mother-child pairs were included, yielding a response rate of 95.2%. The mean age (month) of the children was 11.25(6.433) and more than half the children, 187(52.8%), belonged to the age category below 11 months. Regarding the age of respondents, the majority 329,(92.9%) of them were in the age category below 30. The mean age (year) of the mothers was 24.91(3.472). More than half of the respondents 181(51.2%) attended secondary and above education . Nearly half 160(45.3%) of the respondents were housewives. In terms of wealth status , 116(32.8%) and 93 (26.2%) ranked in the higher and lower tertiles, respectively **(table 2).**

Table 2:Demographic and socio-economic characteristics of Mothers of Infants in Mettu town, 2021 (n=354)

Variable	Categories	Frequency	Percentage
Sex of the child	Male	184	51.98
	Female	170	48.02
Age of a child/months	0-11	187	52.8
	12-23	167	47.2
Maternal Age	<30	329	92.9
	≥30	25	7.1
Religion of mother	Orthodox	136	38.5
	Muslim	111	31.4
	Protestant	96	27
	Others*	11	3.1
Ethnicity of Mother	Oromo	289	81.7
	Amhara	36	10.1
	Gurage	14	4.00
	Others**	15	4.20
	No formal education	32	9.0
Level of education	Primary	141	39.8
	Secondary and above	181	51.2
	House wife	160	45.3
Occupational status	Merchant	36	10.2
	Government employee	53	14.9
	Private employee	48	13.7
	Student	39	10.9
	Others***	18	4.97

7

Current marital status	Married	321	90.7
	Single	20	5.6
	Divorced	11	3.1
	Widowed	2	0.6
Family size	<3	96	27.2
	4-5	165	46.5
	>5	93	26.3
Wealth status	Lower tertile	93	26.2
	Middle tertile	145	41.0
	Higher tertile	116	32.8

*Catholic, Wakefata, &Jiohava   **Kambata, Hadiya, Tigre, Agnuak&Nuer ***Daily labourer

3.2. Information on availability of health facility with specific health services

In this study, nearly half 168(47.5%) of the study participants took thirty minutes or less to reach the nearest health facility. More than two-thirds (272(76.7%) of respondents prefer to go to health centres for their children's care. Regarding the perceived awareness of the respondents to the availability of GMP services, half of 187 (52.8%) of the respondents were aware of the availability of GMP services at health facilities **(table 3)**.

Table 3: Information on availability and accessibility of health services among mother-child pair, Mettu town, 2021(n=354)

Variable	Category		Frequency	Percentage
Time it takes to the nearest health facility	≤30minutes		168	47.5
	>30minutes		186	52.5
The most frequently visited health facility for child care.	Health centre		272	76.7
	Health post		9	2.5
	Private clinic		51	14.3
	Hospital		23	6.5
Perceived awareness on availability of specific health Services	ANC	Yes	318	89.8
		No	36	10.2
	Delivery	Yes	301	85.1
		No	53	14.9
	PNC	Yes	242	68.3
		No	112	31.7
	GMP	Yes	187	52.8

8

	No	167	47.2

3.3. Information on utilization of maternal and child health service

Among 354 mothers who participated in this study, more than half 181 (55.5%) the mothers had ANC follow-up with a frequency of visits of four or more. The majority of the mothers 334(94.4%) delivered at health institutions, but only one third 123(34.8%) of the mothers had an early PNC. **(table 4)**.

Table 4: Variables used to assess the information on MCH service among mothers and their children, Mettu, Ethiopia, 2021 (n=354)

Variable	Category	Frequency	Percentage
ANC follow-up	No	25	7.1
	Yes	329	92.9
Frequency of ANC follow-up	<4 visits	147	44.8
	≥ 4 visits	181	55.5
Place of delivery	Home	20	5.6
	Health institution	334	94.4
Early-PNC	No	231	65.2
	Yes	123	34.8
Vaccination status of the child	Not vaccinated	9	2.5
	Vaccinating	137	38.8
	Defaulter	6	1.6
	Fully vaccinated	202	57.1
Reason for not vaccinated	Distance to EPI sites	1	12.5
	Do not know the benefit	8	87.5

3.4. Reasons for frequent health facility visits by Mothers

This study revealed that nearly two-thirds 209(59.0%) of the mothers frequently visit health facilities to have their children vaccinated, but only 15(4.3%) of the mothers who participated in the study took their children for weighing or GM service **(figure 1)**.

9

3.5. Child feeding and growth monitoring knowledge of Mothers

The finding of this study reported that, the majority of the respondents 310(87.6%) were counselled on child feeding. Almost all respondents 347(98.1%) provided breast milk to their babies immediately after birth. Nearly half 166(46.9%) of the study participants were utilizing family health cards, and the majority (153(92.05%) of those utilizing mothers were able to read and interpret information displayed on the growth chart **(table 5)**.

Table 5:Child feeding and growth chart knowledge of mothers, Mettu town, 2021 (n=354)

Variable	Category	Frequency	Percentage
Counselled by HCWs on child feeding	No	44	12.4
	Yes	310	87.6
The first thing given after birth	Breast milk	347	98.1
	Other*	7	1.86
Time for BF initiation immediately after birth	Within 1hr	342	96.7
	Greater than1hr	11	3.1
Duration of EBF	3 months	7	1.9
	6 months	344	97.2
	1 year	3	0.9
Total duration of BF	Below 2year	33	9.33
	2year and greater	321	90.68
Do utilize family health card at home.	No	188	53.1
	Yes	166	46.9
Can you read information displayed on growth chart	No	13	7.95
	Yes	153	92.05
Who thought you	HCWs	99	64.95
	By my self	46	30.01
	HEWs	8	5.04
What does it mean if growth curve flattens	Child not growing well	72	46.8
	Child may be sick	31	20.3
	Child not eating well	50	32.9
What does it mean if growth curve rising	Child gaining weight	89	58.4
	Child is healthy	16	10.6

10

	Child is eating well	48	31.0
What does it mean, if growth curve is falling	Child is not gaining weight	66	43.2
	Child may be sick or has been sick	36	23.4
	Child is not eating well	51	33.4

Other* Formula milk, water, cow milk

3.6. Utilization of GM services

This study revealed that one-fourth of 89(25.2%) mothers utilized GM service with [95% CI 20.24–29.33]. Of those respondents who participated in this study, nearly two-thirds 196 (60.9%) knew the benefit of GM. Regarding the benefits of the GM service, half 108(50.5%) of the respondents reported the GM service is used "to monitor the child's growth". More than two-thirds 59(66.7%) of the respondents followed GM sessions at health centers **(table 6)**.

Table 6: Variables to assess utilization of GM, Mettu town, 2021 (n=354)

Variable	Category	Frequency	Percentage
GM utilization status	Utilized	89	25.2
	Not utilized	265	74.8
Know benefit of regular GM session	Yes	216	60.9
	No	138	29.1
Benefit of regularly taking the child for GM session	To monitor growth	108	50.0
	To seek medical care	7	3.06
	To know health status	101	46.94
Place where GMservice given	Health centre	59	66.7
	EPI outreach sites	8	8.45
	Health posts	22	24.85
Who provides the service	HEWs	30	33.15
	HCWs	59	66.8

11

3.6.1 Reasons for not taking the child for GM session

This study reported that, more than one-thirds 135(38.2%) of the respondents who missed taking the child for GM sessions didn't know the benefits of the GMservices, and 102(28.9%) of the mothers lacked information about the services **(Figure 2)**.

3.7. Factors associated with GM service utilization

On multivariable logistic regression analysis, mothers with children aged 0-11 months old [AOR=1.58; (95% CI:(1.052, 3.713)], mothers who had early-PNC [AOR=1.72; (95% CI :(1.657, 6.467)], mothers from households with middle and [AOR=0.108; (95% CI 0.047-0.319)] and lower tertile [AOR=0.073; (95% CI: (0.013-0.874)], mothers utilizing family health card at home [AOR=2.09; (95% CI; 1.384, 5.343)]. Mothers who took thirty minutes and below to reach the nearest health facility [AOR=2.24; (95%CI: 2.061, 7.350)] were factors significantly associated with utilization of GM service **(table 7)**.

Table 7: Bi-variable and multi-variable logistic regression analysis of Utilization of Growth Monitoring Service by Mothers of Infants in Mettu town, 2021(n=354)

Variable	Category	Utilization of GM service		95% CI	
		Yes(%)	No(%)	COR	AOR
Age of index child	12-23months	32(9.01)	135(38.2)	1	1
	≤11months	57(16.15)	130(36.6)	1.87(1.112-3.143)	**1.58(1.052-3.713)****
Frequency of ANC visit	<4	28(7.91)	107(30.22)	1	
	≥4	61(17.23)	110(31.07)	2.12(1.204-3.519)	1.16(0.579-2.305)
Early-PNC	No	46(13.04)	185(52.2)	1	
	Yes	43(12.1)	80(22.7)	2.14(1.277-3.577)	**1.72(1.657-6.467)****
Maternal level of education	No formal education	6(1.60)	26(7.40)	1	
	Primary	27(7.51)	114(32.25)	1.17(0.404-3.356)	0.645(0.179-2.320)
	Secondary and above	56(15.8)	125(35.4)	2.15(0.775-5.946)	0.319(0.088-1.160)
Wealth status	Higher tertile	62(17.5)	54(15.25)	**1**	**1**
	Middle tertile	17(4.80)	128(36.16)	0.116(0.016-0.311)	**0.108(0.047-0.319)****

12

	Lower tertile	10(2.82)	83(23.45)	0.099(0.012-0.697)	**0.073(0.013-0.874)****
Family health	No	33(9.31)	155(43.8)	1	
card utilization	Yes	56(15.8)	110(31.1)	2.40(1.427-4.027)	**2.09(1.384-5.343)****
Perceived	No	27(7.76)	133(37.6)	1	
awareness on	Yes	62(17.4)	132(37.3)	2.26(1.323-3.858)	1.67(0.871-3.203)
GMP availability					
Time to reach	>30minutes	31(8.76)	155(43.78)	1	
nearby health	≤ 30minutes	58(16.38)	110(31.07)	2.64(2.410-7.297)	**2.23(2.061-7.350)****
facility					

Note: ** denote statistically significant variables in multivariable logistic regression at *p-value* <0.05, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio

4. DISCUSSION

GM services are essential until the child's second birthday in order to have a healthy and well-nourished child and to break the intergenerational cycle of malnutrition. Hence, this study was aimed to assess utilization of growth monitoring services and associated factors among mothers of children aged 0–23 months old in Mettu town. The proportion of GM service utilization in this study area was found to be 25.2% with [95% CI: 20.24.-29.33]. This finding is comparable with a study conducted in rural lower part of Ghana 28.5% and Northern Ethiopia 30.7% [20,26].

The finding of this study is lower compared to a study conducted in the Lawra district of Ghana 70% and Nyamira country of Kenya 53.3% [16, 27]. The inconsistency might be due to differences in socio-economic characteristics among the study population, study design and, study period.

However, the finding of the current study was higher compared to a study done in Thika sub-city of Kenya 20%, Mareka district, southern Ethiopia 16.9% and, Butajira District, Southern Ethiopia11% [17-18, 28]. Differences in study setting, socioeconomic and demographic characteristics of study participants, and study period could all explain the disparity..

The age of the index child was found to be significantly associated with the utilization of growth monitoring and promotion services. Mothers with index children under 11 months were 1.5 times more likely to utilize service compared to mothers with index children aged 12–23 months old. The possible explanation might be that children under 11 months old are recommended to go to health facility for several doses of immunization. Thus, most mothers will continue to send them to

13

weighing centers until completion of the immunization. However, as the child's age advances, attendance at GM sessions decreases. This finding is similar to a study conducted in rural Ghana, which discovered a negative correlation between child age and GM service utilization [26]. In contrast to this finding, a study conducted in the Legambo districts of South Wollo zone and Mareka found that mothers with index children aged 12-24 months were more likely to utilize GM services than those aged 11 months or less [18-19]. The inconsistency might be due to the differences in study design and sampling technique employed. The study conducted in Legambo district used an unmatched case-control study design, which may have contributed to this variation.

This study found that mothers who had early-PNC were 1.7 times more likely to utilize growth monitoring services compared to those mothers who had no early-PNC. This relationship between earaly PNC service and the higher utilization of GM could be explained by the child nutrition and health counseling that are provided as part of the PNC service. As a result, they could get more opportunities to receive child growth and development counseling. This study is supported by the a study conducted in Benin that reported mothers who had early PNC were more likely to utilize maternal and child health services [29] .

Utilization of family health cards was another predictor of growth monitoring services in this study. Those mothers utilizing family health cards were 2 times more likely to utilize growth monitoring services compared to those who were not. This might be due to the possibility of family health cards motivating mothers to get GM service. This finding is congruent with a study done in Yilmana woreda of northern Ethiopia [20].

Compared to mothers from households with higher tertile wealth status, mothers from households with lower and middle tertile wealth status were 89% and 92% less likely to utilize GM services, respectively. The study done in Southern Ethiopia supports this finding [18]. The posiible explanation could be that people with lower household tertile might be busy fulfilling their day-to-day livelihood needs and have limited time to attend the GM service.

The time it takes to reach a nearby health facility was found to be significantly associated with GM service utilization. Those mothers who took less than 30 minutes to reach a nearby health facility were 2 times more likely to utilize GM than those mothers who took more than 30 minutes to reach a nearby health facility. This finding was in line with the studies conducted in Yilmana Dedisa and

14

Butajira district [17,20]. This could be because mothers who live near a health facility can bring their children for GM service quickly and return to work, even if they are busy at work.

4.1. Strength and Limitation of the study

There are certain limitations to this research. First, since the data was collected by the verbal report of the participants, there might be a possibility of response bias. Data collctors were trained on some techniques of reducing a response bias during the interview. Second, the study did not assess the qualitative perspective of GM sevice utilization.

5. Conclusions and Recommendation

The study found that only one-fourth of mothers with children aged 0-23 months in Mettu town were utilizing GM services. GM service utilization was significantly associated with index child age, early-PNC, use of family health card, wealth status, and time to reach nearby health facility. Hence, appropriate strategies that promote and encourage GM service utilization should be designed .

Abbreviation

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; CI: Confidence Interval, GM: Growth Monitoring , HEW: Health Extension Worker, ANC: Antenatal Care, PNC: Postnatal Care, NNP: National Nutrition Program.

Authors' contributions

YT; developed the research idea, design, analysis, and drafted the manuscript. AM, SHSH, and KB conceived the study, supervised the data collectors, interpret the result and reviewed the manuscript. All authors read and approved the final manuscript. YT is responsible for the overall content as guarantor.

Data Availability

The data sets analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgment

We would like to acknowledge Mettu University, the department of Public Health, and Mettu town health office for their support throughout the study period. We are also grateful to data collectors, supervisors, and study participants for their valuable contributions.

15

Ethical Approval and Consent to Participate

Ethical clearance was obtained from the ethical review board of Mettu University, College of Health Science (Ref. No.RPG 42/20) submitted to Mettu town health office. The letter of permission was obtained from Mettu town health office. Before beginning the data collection, written consent was obtained from the study participants after clear information was provided about the objectives of the study. The study was conducted in accordance with the Helsinki Declaration.

Conflict of Interest

The authors declare that they have no competing interests regarding the publication of this article.

REFERENCES

[1]   P. Garner, R. Panpanich, and S. Logan, "Is routine growth monitoring effective? A systematic review of trials... including commentary by Davies DP.," *Arch. Dis. Child.*, vol. 82, no. 3, pp. 197–201, 2000, [Online]. Available: http://www.epistemonikos.org/documents/e2b62e1929a334513c1b4fd795155729f2284025.

[2]   A. Ashworth, R. Shrimpton, and K. Jamil, "Growth monitoring and promotion: Review of evidence of impact," *Matern. Child Nutr.*, vol. 4, no. SUPPL.1, pp. 86–117, 2008, doi: 10.1111/j.1740-8709.2007.00125.x.

[3]   M. Griffiths and J. Del Rosso, "GROWTH MONITORING AND THE PROMOTION OF HEALTHY YOUNG CHILD GROWTH: Evidence of Effectiveness and Potential to Prevent Malnutrition," *Matern. Child Nutr.*, no. November, pp. 86–117, 2008.

[4]   UNICEF, "Experts ' consultation on growth monitoring and promotion strategies : Program guidance for a way forward Recommendations from a Technical Consultation UNICEF Headquarters New York , USA," pp. 1–8, 2008.

[5]   N. Mangasaryan, M. Arabi, and W. Schultink, "Revisiting the concept of growth monitoring and its possible role in community-based nutrition programs," *Food Nutr. Bull.*, vol. 32, no. 1, pp. 42–53, 2011, doi: 10.1177/156482651103200105.

[6]   C. Lu, M. M. Black, and L. M. Richter, "Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level," *Lancet Glob. Heal.*, vol. 4, no. 12, pp. e916–e922, 2016, doi: 10.1016/S2214-109X(16)30266-2.

[7]   UNICEF, *Tracking Progress on Child and Maternal Nutrition*. 2009.

[8]   Levels and trends in child malnutrition: key findings of the 2018 Edition of the Joint Child Malnutrition Estimates. Geneva: World Health Organization; 2018 ..

16

[9]   WHO and W. Bank, "Levels and trends in child malnutrition," 2019.

[10]   Ethiopian *Mini Demographic and Health Survey*. 2019.

[11]   Afrirican development bank and agance frace development Wfp, "The Cost of hunger in Africa: Ethiopia WFP," 2014.

[12]   Investing In Nutrition The Foundation For Development. An Investment Framework To Reach The Global Nutrition Targets" 2015.

[13]   "Nutrition Program Planning and Supervision : For Health and Agriculture Program Managers Reference Manual July 2013 Nutrition

[14]   A. Yeshaneh, T. Fentahun, T. Belachew, A. Mohammed, and D. Adane, "Utilization of growth monitoring and promotion services and associated factors among children aged 0-23 months in Banja District, Northwest Ethiopia 2020: A crosssectional study," *PLoS One*, vol. 16, no. 11 November 2021, pp. 1–14, 2021, doi: 10.1371/journal.pone.0259968.

[15]   S. M. Bilal, A. Moser, R. Blanco, M. Spigt, and G. J. Dinant, "Practices and challenges of growth monitoring and promotion in Ethiopia: A qualitative study," *J. Heal. Popul. Nutr.*, vol. 32, no. 3, pp. 441–451, 2014.

[16]   D. Tuobom Debuo, "Caregivers Knowledge, Attitude and Practices on Child Growth Monitoring and Promotion Activities in Lawra District, Upper West Region of Ghana," *Sci. J. Public Heal.*, vol. 5, no. 1, p. 20, 2017, doi: 10.11648/j.sjph.20170501.13.

[17]   L. Desalegne, S. Shiferaw, D. Haile, and T. Submitted, "Assessment of Knowledge and Utilization of Growth Monitoring and Promotion for under two children in Butajira, Ethiopia 2017," no. June, 2017.

[18]   F. W. Feleke, A. A. Adole, and A. M. Bezabih, "Utilization of growth monitoring and promotion services and associated factors among under two years of age children in Southern Ethiopia," *PLoS One*, vol. 12, no. 5, pp. 1–9, 2017, doi: 10.1371/journal.pone.0177502.

[19]   S. Dagne, "Determinants of Growth Monitoring and Promotion Service Utilization Among Children 0-23 Months of Age in Northern Ethiopia : Unmatched Case Control Study," *Res. Sq.*, vol. 1, pp. 15–20, 2020.

[20]   S. Yeniew, "Utilization of Growth Monitoring and Promotion Service By Mothers of Children 0-23 Months Old in Yilmana Denisa Woreda ," 2020.

[21]   S. Dagne, J. Aliyu, Y. Menber, Y. Wassihun, P. Petrucka, and N. Fentahun, "Determinants of growth monitoring and promotion service utilization among children 0–23 months of age in northern Ethiopia: unmatched case-control study," *BMC Nutr.*, vol. 7, no. 1, 2021, doi: 10.1186/s40795-021-00470-y.

17

[22] M. Tekle, B. Tariku, A. Alagaw, E. Zerihun, and H. W. Bekele, "Exploring Reasons for Low Attendance of Mothers to Growth Monitoring and Promotion Program at Loka Abaya District, Southern Ethiopia: Exploratory Qualitative Study," *J. Nutr. Metab.*, vol. 2019, pp. 6–7, 2019, doi: 10.1155/2019/3510649.

[23] M. Faber, M. A. S. Phungula, J. D. Kvalsvig, and A. J. S. Benadé, "Acceptability of community-based growth monitoring in a rural village in South Africa," *Food Nutr. Bull.*, vol. 24, no. 4, pp. 350–359, 2003, doi: 10.1177/156482650302400405.

[24] T. G. Gebrehiwot *et al.*, "Prevalence and associated factors of early postnatal care service use among mothers who had given birth within the last 12 months in Adigrat town, Tigray, northern Ethiopia, 2018," *Int. J. Womens. Health*, vol. 12, pp. 869–879, 2020, doi: 10.2147/IJWH.S266248.

[25] EDHS, *FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA Demographic and Health Survey*. 2016.

[26] F. Seidu, "Utilisation of Growth Monitoring and Promotion is Highest Among Children Aged 0-11 Months : A Survey Among Mother-Child Pairs From Rural."

[27] Jane Ilusa Nyabuti"Factors associated with the continuation of growth monitoring among children 10 to 59 months old," vol. 1, pp. 5–6, 2015.

[28] K. Lucy Mwari, M. N. Keraka Professor, K. University, and K. A. Jemimah Simbauni, "Care Giver Deteminants Of Utilization Of Growth Monitoring Clinic Among Children Aged 12-59 Months In Urban Kiambu County, Kenya," *Int. J. Innov. Res. Adv. Stud.*, vol. 4, no. 6, pp. 334–338, 2017.

[29] E. Budu *et al.*, "Maternal healthcare utilization and full immunization coverage among 12–23 months children in Benin: a cross sectional study using population-based data," *Arch. Public Heal.*, vol. 79, no. 1, pp. 1–12, 2021, doi: 10.1186/s13690-021-00554-y.
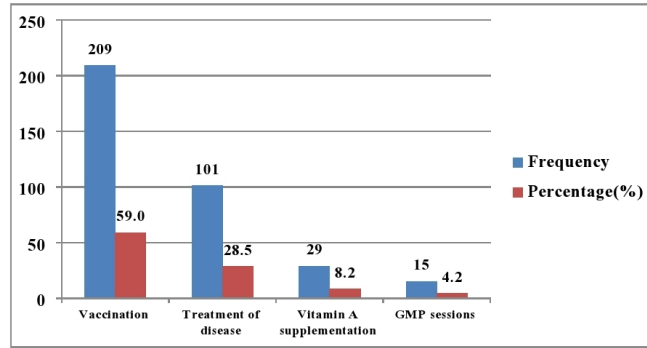
18

Figure 1: Mothers' most common reason to visit health facility, Mettu town, 2021 (n=354)

449x582mm (72 x 72 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
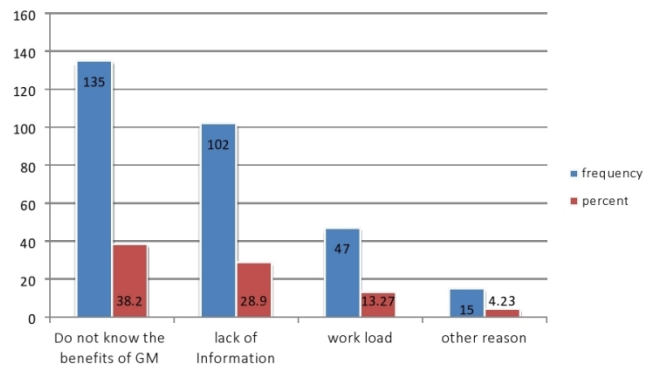41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Figure 2: Reasons for not regularly taking the child for GM session, Mettu town 2021(n=354)

449x582mm (72 x 72 DPI)