

Level of Maternal Health Literacy (MHL) and Associated Factors among Pregnant Women Attending Antenatal Care Clinics of Public Health Facilities in Southern Ethiopia, 2021: A Facility Based Crosssectional Study with Linear Models

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Abstract

Background: Maternal Health Literacy (MHL) is defined as a woman's cognitive and social abilities and motivation to access, assess, understand and use basic health information and services to make informed decisions that protect and promote their own and their children's health. Pregnant women's HL will enhance the effectiveness and long-term viability of those services by allowing them to get health-related knowledge and behaviours during this critical period. As a result, this study aimed at assessing the level of health literacy and associated factors among pregnant women in Southern Ethiopia, 2021.

Methods: A facility-based cross-sectional study was conducted among 635 pregnant women attending ANC units of selected health facilities from January 1 to February 30, 2021, by using pre-tested, interviewer-administered questionnaires. A multistage sampling technique was employed and study participants were selected by using a systematic random sampling technique. Data were entered into EpiData3.1 and exported to SPSS version 23 for analysis. A bivariable statistical analysis was performed through analysis of variance (ANOVA) and independent t-tests and variables with a p-value of < 0.05 were eligible for the multiple linear regression model. To see the weight of each explanatory variable on MHL, multiple linear regression was employed, and the strength and direction of the association were reported by using a regression coefficient (β) with the respected 95% confidence interval.

Results: The mean health literacy score of study participants was 23.85 ± 2.87 in which, more than half, 336 (53.5%) (95%CI: 49.1, 58.1) of the study participants had a good MHL level or above the mean score. The multiple linear regression analysis results revealed a significant relationship between MHL and educational level (β : 1.358; $p < 0.001$), gravidity (β : 1.439; $p < 0.001$), ANC visits (β : 1.418; $p < 0.001$), enrolment in CBHI scheme (β : 2.282; $p < 0.001$) and being a model household (MMH) (β : 1.681; $p < 0.001$).

Conclusion and recommendation: The pregnant women in the current study area had a low level of maternal health literacy. Local governments should focus their efforts on establishing adult literacy centers in their respective locations. Pregnant women should be encouraged to attend adequate ANC visits, as per health care providers. Finally, at the community level, administrative bodies and health professionals should work on developing a model household and enrolling unenrolled households in the CBHI scheme.

Introduction

According to the World Health Organization (WHO) 2017 report, Every day, approximately 810 women died from preventable causes related to pregnancy and childbirth and 94% of all maternal deaths occur in lower and low and middle-income countries[1]. Sub-Saharan Africa accounts for the bulk of maternal deaths, with 534 per 100,000[2]. During the period 1990–2013, maternal mortality in Ethiopia decreased from 708 per 100,000 live births in 1990 to 497 per 100,000 in 2013. However, with a reported MMR of 412 deaths per 100,000 live births, the ratio remains unacceptably high[3, 4]. This has been linked mostly to poor maternal health literacy(MHL), which has resulted in a lack of access to health care, a lack of

knowledge of danger signs, a lack of birth preparedness and complication readiness plans, and unmet family planning needs among reproductive-aged women in the country[5].

Maternal Health Literacy (MHL) is defined as a woman's cognitive and social abilities and motivation to access, assess, understand and use basic health information and services to make informed decisions that protect and promote their own and their children's health[6, 7]. It also includes capabilities such as the skill to read and comprehend physician's prescriptions and instructions, testimonials, booklets, and drug brochures, as well as the ability to acquire health care[8].

MHL can be measured in four main domains namely: maternal health knowledge about pregnancy and danger signs, maternal health information search(access), maternal health information assessment, and maternal health decision-making power[9]. Those domains deal with the ability to detect danger signs during pregnancy and childbirth, proper nutrition and lifestyle modification during pregnancy, better acclimatization to pregnancy changes, and Birth preparedness and complication readiness (BPCR) are all activities and skills in MHL that are required for healthy maternity[9, 10]. It also gives women the ability to obtain timely prenatal care, make informed decisions, and learn about accepting midwifery interventions during labor and delivery [10].

Pregnancy is a critical time in which women face a variety of changes, not just physically but also in terms of the responsibilities that come with being pregnant and being a parent. These changes make women and parents more receptive to health-prevention information[11]. From both the mother's and the baby's perspectives, health literacy has a direct impact on pregnancy. MHL also influences how the woman will go in the future in her search for solutions to her own and her family's health concerns[12]. If a pregnant woman is using the health system for the first time because of her pregnancy, her ability to use it may be hindered if she has a low level of health literacy[13].

Inadequate HL is linked to a slew of unfavorable outcomes, including a high illness burden accompanied by greater healthcare expenses, high mortality, poorer use of preventative programs and higher use of medical services, negative health behaviors like drug and alcohol abuse, and unhealthy diet[14, 15]. Furthermore, pregnant women with low HL are unable to fully comprehend the range of services that a health system can provide for them and their families, and they become hesitant to seek help for problems they notice in themselves or their newborn infants, which causes treatment to be delayed or results in poor health outcomes[16].

Pregnant women with low health literacy were more likely than those with adequate health literacy to be exposed to drug addiction, failure of exclusive breastfeeding, poor birth preparedness, and complication readiness plans, and poor prenatal care participation[17–19]. Excessive gestational weight gain (GWG) can be induced by a pregnant woman's nutrition and physical activity and has been linked with an increased risk of obesity and chronic illnesses in offspring, such as type 2 diabetes, as well as increased pregnancy and birth complications[20]. Women with good health literacy, on the other hand, had a lower risk of having preterm and low-birth-weight babies, lower rates of neonatal death, a higher likelihood of

giving birth in a health facility, higher self-efficacy in breastfeeding, and better access to childhood vaccine information than those with ill health literacy[21–24].

According to several studies, the prevalence of pregnant women with low health literacy ranges from 15–44% [13, 25, 26]. In studies conducted in Tanzania and Huan, 42% and 30% of pregnant women, respectively, did not recognize any of the signs of risk during pregnancy and childbirth[27, 28]. Maternal age, ANC visits, maternal and husband education, marital status, household income, employment status, media exposure, obstetric difficulty history, and community-based health education programs have all been associated with MHL in studies[21, 29, 30]. Although many studies have been conducted to examine the level of health literacy, relatively few studies on MHL have been done, particularly among pregnant women in low and middle-income countries, particularly in Ethiopia[31].

Pregnant women's HL will enhance the effectiveness and long-term viability of those services by allowing them to get health-related knowledge and behaviors during this critical period[13, 26]. Knowing the level and factors that influence MHL can aid in the development of educational interventions that improve health literacy, such as written education materials with appropriate reading levels and design, clear communication, and education to improve health knowledge, self-efficacy, and self-advocacy skills. As a result, this study aimed at assessing the level of health literacy and associated factors among pregnant women in the Guraghe Zone of Southern Ethiopia, 2021.

Methods And Materials

Study setting, period, and design

A facility-based cross-sectional study was undertaken in the ANC units of selected health facilities of Guraghe zone from January 1 to February 30, 2021. Guraghe zone is one of the 17 zones that make up Southern Nations, Nationalities, and Peoples' Region (SNNPR). Administratively, it is divided into 12 districts and four town administrations. Wolkite town, the zone's capital, is 337 kilometres from Hawassa, the regional capital, and 158 kilometres from Ethiopia's capital, Addis Ababa. The zone is divided into 11 administrative districts and 174 rural kebeles (kebele: the smallest administrative unit next to the district). There were seven hospitals (five general and two primary hospitals) and 72 health centers that provide maternal and child health services. The overall population of the district in the fiscal year 2020 was 1,835,110, with 19.8% of that being women of reproductive age (15-49 years old).

The population of the study

All pregnant women who attended ANC in public health facilities in Guraghe zone made up the source population. The study population comprised of pregnant women found in ANC clinics of selected health facilities during the study period. The study comprised pregnant women who were attending ANC at certain health facilities. Women working in health centers, who were diagnosed with complications of pregnancy (including preeclampsia, Eclampsia, placenta previa, and placental abruption) at the time of data collection were excluded from the study.

Sample size determination

The sample size for the study was determined using Epi Info version 7 StatCalc function of sample size calculation for population survey at 95% CI, 5% margin of error, and expected proportion of MHL(50%) since there was no study conducted in Ethiopia.

$$n = \frac{Z \left(\frac{\alpha}{2} \right)^2 (p) (1-p)}{d^2} = \frac{(1.96)^2 (0.5) (0.5)}{(0.05)^2} = 384$$

After consideration of a 10% non-response rate and a design effect of 1.5, the total sample size for the study was 635.

Sampling procedures

A multistage sampling technique has been used to obtain a representative sample. Five districts were chosen by lottery from a total of thirteen. There are a total of 25 health centers in the selected districts. The number of health centers in each of the selected districts is equal, so a total of 10 (2 health centers from each) were picked by lottery method. The sample size was proportionally allocated to each health facility based on the number of pregnant women who attended the ANC clinics in selected health facilities in the same months of the previous fiscal year (January 1–February 30, 2020). Finally, women were randomly selected and interviewed in a private place until the maximum sample size for each health facility was attained(S1Fig).

S1Fig: sampling procedure to access study participants in public health facilities of Guraghe zone, Southern Ethiopia, 2021

Data collection tools, methods, and personnel

After a thorough review of the literature in the area of interest, interviewer-administered structured questionnaires were developed [7, 9, 10, 15, 32]. The tool used to assess maternal health literacy consists of 44 items organized into four categories: maternal health knowledge (19 items), maternal health information search (access) (6 items), maternal health information assessment (6 items), and maternal health decision-making power (13 items)[9]. The tool was shown to be reliable and had acceptable validity in African countries[33, 34]. Household socioeconomic status was assessed using a tool adapted from the 2016 EDHS, which included multiple items such as household assets, livestock ownership, crop production in quintals, average estimated monthly income, agricultural land ownership in hectares, and residential home with its infrastructures[4]. The data collection tool also included socio-demographic features, information on maternal and child health services, and health system-related characteristics of the respondents. As data collectors and supervisors, ten Bsc nurses and three BSc Public health professionals with experience in data collection and who did not work in the antenatal care units of the selected health facilities were recruited.

Data Quality management

The data collection tool was first prepared in English and translated into the local language by an expert in that language, then translated into English to ensure consistency with the original meanings. A pre-test was conducted on 5% of the sample size (32 pregnant women) at the ANC unit of Worabe Comprehensive Specialized Hospital. The reliability of the questionnaire was assessed using Cronbach's alpha and got a coefficient of 0.89. A one-day training that focused on the study's objective, data collection procedures, and ethical issues was provided for the data collectors and supervisors. The immediate supervisor in the field and the principal investigator checked all of the collected data for completeness and consistency before being entered into the software. To ensure validity and comparability to the original data, double data entry was done.

Measurement of variables of the study

Outcome variable

The level of maternal health literacy (MHL) was assessed by using four domains that contain a total of 44 items. Those 4 domains were: 1) maternal health knowledge (19 items), 2) maternal health information search (6 items), 3) maternal health information assessment (6 items) and 4), maternal health decision-making power (13 items). Information on these items was derived from the response to the questions like “Do you know about natural physical changes during pregnancy? Do you get information from radio and television? Did you understand information obtained from different sources? Did you take the appropriate personal hygiene precautions while pregnant? ... Yes = 1 and No = 0 were developed as answer categories for each item. Finally, a composite index of MHL was created, with 0 and 44 being the minimum and maximum values, respectively. The level of MHL was established by using the mean score as a cut-off point, with those scoring the mean and above regarded to have good MHL and those scoring below the mean deemed to have poor MHL.

Explanatory variables

Women's Decision-Making Autonomy: When a woman decides on at least one of the following 3 things alone or jointly (with her husband), she is said to be autonomous of decision-making power: (1) her own health (personal decision-making authority), (2) economic decision-making authority, and (3) visits friends or relatives (mobility decision-making authority). When her husband or a third party decides on any of the above-mentioned activities, she is considered no autonomous[4, 35].

Community-based health insurance (CBHI) scheme enrolment status: Acceptance to be a member of the system and paid a fee for a full year and have an updated service card[36].

Model households (MHHs): Those who have implemented 75% of four components of the health extension packages (HEPs) and have received formal certification. Those HEPs encompass interventions that fall under four categories: Family Health Services, Infectious disease Prevention and Control, Hygiene and Environmental Sanitation, and Health Education and Communication [37].

Data analysis

The Data were coded, and entered into EpiData version 3.1, and exported to SPSS version 23.0 for analysis. By applying running frequencies, inconsistencies and missing values were checked. Descriptive statistics have been calculated, such as frequency distributions, mean and standard deviation. By operating principal component analysis (PCA), the wealth status of households was computed. Firstly, 28 items were used and alienated into six components, namely: household property, livestock possession, average monthly estimated income, and housing conditions. PCA assumptions like overall sampling adequacy, sampling adequacy of individual variables, and the Bartlett Sphericity Test were all checked. Before the criteria were met iteratively, these variables with communalities less than 0.5 and complex structures (i.e. having correlations greater than 0.4 in more than one component) were removed in each step. Finally, three components were extracted from the PCA that clarified a total variance of 71.9%, and one of the components with a maximum explained variation (46.3%) was taken to rate the study participants' household wealth status in quintiles.

A bivariable analysis using analysis of variance (ANOVA) and independent t-tests had been used to identify a significant difference in the mean MHL across covariates, and variables with a p-value <0.05 were eligible for a multiple linear regression model. To identify factors possibly associated with MHL, multiple linear regression was conducted and significant factors were identified at p-value <0.05. Regression coefficient (β) with the respected 95% confidence interval were reported to show the strength and direction of the association. Before starting the analysis, assumptions for linear regression such as normality, linearity, and multicollinearity were checked.

Results

Sociodemographic characteristics of the respondents

A total of 628 pregnant women took part in the study, with a response rate of 98.9%. The respondents' mean (\pm SD) age was 29.8(\pm 4.8) years, with the majority, 491 (78.2%), falling into the 20-34 year age category. Rural residents made up over three-fifths of the total (367, or 58.4%). The majority of respondents, 574 (91.4%), belonged to the Guraghe ethnic group, while 351 (55.9%) were Orthodox religion followers. Nearly half of the respondents, 307 (48.9%), had no formal education and 188 (29.9%) had attended primary school (Table1).

Table1: Socio-demographic characteristics of pregnant women attending ANC clinics in Public health facilities of Guraghe zone, Southern Ethiopia, 2021

| Variables categories | Count | Percent |
|-----------------------------------------|--------------|----------------|
| Age (n=628) | | |
| <20 | 41 | 6.5 |
| 20-34 | 491 | 78.2 |
| ≥30 | 96 | 15.3 |
| Residence (n=628) | | |
| Rural | 368 | 58.4 |
| Urban | 260 | 41.8 |
| Marital status (n=628) | | |
| In marital relationship | 590 | 93.9 |
| Not in marital relationship* | 38 | 6.1 |
| Ethnicity (n=628) | | |
| Guraghe | 574 | 91.4 |
| Amhara | 41 | 6.5 |
| Others* | 13 | 2.1 |
| Religion(n=628) | | |
| Orthodox | 351 | 55.9 |
| Muslim | 217 | 34.5 |
| Protestant | 40 | 6.4 |
| Catholic | 20 | 3.2 |
| Mother's education level (n=628) | | |
| No formal education | 307 | 48.9 |
| Primary education | 188 | 29.9 |
| Secondary education | 77 | 12.3 |
| College and above | 56 | 8.9 |
| Mother's Occupation(n=628) | | |
| Housewife | 402 | 64.0 |
| Private business work | 144 | 22.9 |
| *Others: Oromo, Hadiya, Wolaita | | |

| Variables categories | Count | Percent |
|--------------------------------------------|--------------|----------------|
| Farmer | 42 | 6.7 |
| Government employer | 22 | 3.5 |
| Daily laborer | 18 | 2.9 |
| Husband's educational level (n=590) | | |
| No formal education | 240 | 40.7 |
| Primary education | 182 | 30.8 |
| Secondary education | 91 | 15.4 |
| College and above | 77 | 13.1 |
| Husband's occupation (n=590) | | |
| Farmer | 364 | 61.7 |
| Private business work | 147 | 24.9 |
| Government employer | 62 | 10.5 |
| Daily laborer | 17 | 2.9 |
| Wealth index (n=628) | | |
| Lowest | 114 | 18.1 |
| Second | 126 | 20.1 |
| Middle | 132 | 21.0 |
| Fourth | 126 | 20.1 |
| Highest | 130 | 20.7 |
| Family size (n=628) | | |
| ≤5 | 432 | 68.8 |
| ≥6 | 196 | 31.2 |
| *Others: Oromo, Hadiya, Wolaita | | |

Obstetric characteristics of the respondents

In terms of the number of pregnancies, the majority of respondents, 365 (58.1%), were pregnant 2-4 times. The vast majority of the women (511, or 81.4 percent) had at least one ANC follow-up during their previous pregnancy. Nearly one-third of the women, 203 (32.3%), and a quarter, 150 (23.9%), attended 2nd and 3rd ANC visits for the current pregnancy, respectively. In terms of delivery place, 397 (69.8%) and 114 (20.0%) of women gave birth at a health facility and a hospital, respectively. The majority of women, 481

(76.6%), reported that their current pregnancy is planned (Table2). Nearly a quarter of respondents, 149 (23.7%), experienced at least one danger sign during their current pregnancy, with 53 (35.6%) reporting extreme nausea and vomiting, prompting a visit to a health facility (Figure1).

Table 2

The current and previous obstetric characteristics of pregnant women attending ANC clinics of public health facilities in Guraghe zone, Southern Ethiopia, 2021

| Variables Category(n=628) | Frequency | Percent |
|--------------------------------------------------------|------------------|----------------|
| Gravidity | | |
| One | 59 | 9.4 |
| 2-4 | 348 | 55.4 |
| ≥5 | 221 | 35.2 |
| Parity | | |
| Nulliparous | 59 | 9.4 |
| Primiparous | 96 | 15.3 |
| Multiparous | 364 | 58.0 |
| Grand multiparous | 109 | 17.3 |
| Planning status of pregnancy | | |
| Planned | 481 | 76.6 |
| Unplanned | 147 | 23.4 |
| Ever had abortion | | |
| Yes | 125 | 19.9 |
| No | 503 | 80.1 |
| Previous history of ANC | | |
| Yes | 511 | 81.4 |
| No | 117 | 18.6 |
| ANC visit for the current pregnancy | | |
| 1st visit | 132 | 21.0 |
| 2nd visit | 203 | 32.3 |
| 3rd visits | 150 | 23.9 |
| 4th and more visits | 143 | 22.8 |
| Place of delivery for previous pregnancy(n=569) | | |
| Health center | 397 | 69.8 |
| Hospital | 114 | 20.0 |

| Variables Category(n=628) | Frequency | Percent |
|--------------------------------|-----------|---------|
| Health post | 36 | 6.3 |
| Home | 22 | 3.9 |
| Mode of delivery (n=569) | | |
| SVD | 361 | 63.4 |
| Instrumental delivery | 132 | 23.2 |
| Cesarean delivery | 76 | 13.4 |
| Faced at least one danger sign | | |
| Yes | 149 | 23.7 |
| No | 479 | 76.3 |

Fig. 1. List of reported danger signs during the current pregnancy among respondents in Guraghe zone, Southern Ethiopia, 2021

Health system-related characteristics of the respondents

Nearly three-quarters of pregnant women, 464 (73.9%), visited a health institution after traveling for more than 30 minutes, and the majority, 442 (70.4%), did so on foot. A total of 441 participants (70.2%) were enrolled in the Community Based Health Insurance (CBHI) scheme. A high proportion, 564 (89.8%) of respondents, stated that Health Extension Workers (HEWs) were available in their community. The majority of respondents, 518 (82.5%), were autonomous in their decision-making regarding the utilization of maternal health care. 432 (68.8%) of respondents were recognized as model households for completing health extension packages (MHH).

The level of each domain of maternal health literacy (MHL) among the respondents

Domain1: Maternal health knowledge

The majority of the study participants, 412 (65.5%) (95%CI: 61.8, 69.3), have good maternal knowledge of pregnancy and pregnancy-related concerns, as measured by a total of 19 items. About three-quarters, 468 (74.5%) of women were aware of at least one common pregnancy complaint, such as nausea, vomiting, or lower back pain. More than seven out of ten respondents (71.4%) were able to mention at least one danger sign during pregnancy. Just 184(29.3%) pregnant women were aware of the symptoms of diseases that occurred during pregnancy, such as gestational diabetes, high blood pressure, and other conditions (Table3).

Table3: The level of maternal health knowledge among pregnant women attending ANC clinics in public health facilities of Guraghe zone, southern Ethiopia, 2021

| Items for assessing maternal health knowledge | Yes= [n(%)] |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Informed about natural physical changes during pregnancy | 442(70.4) |
| Understand the natural psychological changes during pregnancy | 409(65.1) |
| Knowing about proper nutrition during pregnancy | 345(54.9) |
| Knowing how to keep personal hygiene | 470(74.8) |
| Knowing about the need for proper exercise during pregnancy | 215(34.2) |
| Knowing about pregnancy supplements (Folic acid supplementation) | 377(60.0) |
| Knowing the appropriate referral timing for pregnancy examinations | 248(39.5) |
| Understanding diagnostic examination (ultrasound and tests) of maternal and fetal health in pregnancy | 347(55.3) |
| Knowing about the importance of keeping acceptable and normal body weight gain during pregnancy | 222(35.4) |
| Knowing about at least one common pregnancy problem such as nausea, vomiting, lower back pain | 468(74.5) |
| Knowing about injecting safe (authorized) vaccines during pregnancy | 440(70.1) |
| Knowing about the proper sexual relation during pregnancy | 187(29.8) |
| Knowing the normal number of fetal movements | 255(40.6) |
| Know the factors affecting fetal health such as smoking, excess alcohol consumption, medications, chemicals... | 410(65.3) |
| Knowing about danger signs during pregnancy | 448(71.4) |
| Knowing about pregnancy disease symptoms such as gestational diabetes, high blood pressure in pregnancy, and other diseases | 184(29.3) |
| Knowing about childbirth such as the advantages and disadvantages of each of the natural delivery methods and cesarean section and their associated care | 445(70.9) |
| Knowing about neonatal and infant care in the postpartum period | 472(75.2) |
| Knowing about the required number and timing of postpartum visits | 378(60.2) |

Domain2: maternal health information search (Access)

The majority of the study participants, 391 (62.9%) (95%CI: 58.9, 66.6), have adequate maternal health information access during pregnancy. Written resources such as books, educational notes, pamphlets, and medication brochures were used by more than one-third of pregnant women (35.4%). Healthcare practitioners were the most common source of knowledge, accounting for 502 (79.9%), followed by radio and television (409 (65.1%), and family and friends (378). (60.2%). Only 98 (15.6%) of respondents got their information via the internet.

Domain3: Maternal health information assessment (Comprehension)

More than half of the respondents, 332 (52.9%) (95%CI: 48.7, 56.5), had a good capacity for assessing the contents of maternal health information, according to the study. Nearly three-quarters of the study participants, 463 (73.3%), were familiarizing themselves with credible and validated sources to obtain accurate information about their health throughout pregnancy. Nearly three-fifths, 360 (57.3%), can comprehend information gathered from various sources (Table4).

Table4: The level of health information assessment among pregnant women attending ANC clinics in public health facilities of Guraghe zone, southern Ethiopia, 2021

| Items for assessing the level of maternal health information assessment | Yes=[n(%)] |
|------------------------------------------------------------------------------------------------------|------------|
| Easy to read and pronounce pregnancy-related information sources such as books, educational booklets | 323(51.4) |
| Understanding information obtained from different sources | 360(57.3%) |
| Getting familiar with reliable and verified sources to get the right information | 463(73.3) |
| Asking the doctor or midwife to make sure information is reliable | 328(52.2) |
| Evaluating the accuracy of pregnancy-related information obtained from online sources | 103(16.4) |
| Evaluating the accuracy of pregnancy-related information obtained from friends and relatives | 278(44.3) |

Domain4: The level of maternal health decision making power during pregnancy (Health decision making and application)

The level of maternal health decision-making power was measured, and nearly half of pregnant women, 295 (47.1%), (95% CI: 43.2, 50.6), had good decision-making power. Almost half of those interviewed, 315 (50.2%), say they can regulate and control physical and psychological changes that occur during pregnancy. A comparable number of research participants, 376 (59.9%), can take pregnancy supplements as advised by a doctor or midwife, and 375(59.7%) can consult with a doctor or midwife before taking any form of medication while pregnant. Furthermore, 420 (66.9%) of respondents received prenatal follow-up as scheduled by health care providers (Table5).

Table5: The level of maternal health decision making power among pregnant women attending ANC clinics in public health facilities of Guraghe zone, southern Ethiopia, 2021

| Items for assessing Maternal health decision-making power | |
|------------------------------------------------------------------------------------------------------------------|-----------|
| Ability to manage and control physical and psychological changes in pregnancy | 315(50.2) |
| Implement a proper diet for pregnancy | 268(42.7) |
| Implement necessary measures for personal hygiene during pregnancy | 342(54.5) |
| Adhere to the principles of activity and proper condition during pregnancy | 162(25.8) |
| Taking pregnancy supplements as directed by doctor or midwife | 376(59.9) |
| Consult with the doctor or midwife for taking any type of medication during pregnancy | 375(59.7) |
| Attending for prenatal care (examinations) as scheduled | 420(66.9) |
| Performing ultrasound and tests in pregnancy recommended by healthcare professionals such as doctor | 94(15.0) |
| Monitoring the weight gain during pregnancy | 189(30.1) |
| Avoiding harmful practices during pregnancy | 470(74.8) |
| Seeing the doctor or midwife as soon as possible when any danger signs during pregnancy were observed | 440(70.1) |
| Asking the doctor or midwife for further explanation if the information and recommendations are not clear enough | 377(60.1) |
| Participate in decision making about pregnancy issues with the doctor or midwife (providing personal opinions) | 401(63.8) |

Overall Level of maternal health literacy

The level of maternal health literacy (MHL) was measured using four domains and 44 items, and the mean literacy level of participants in the study was 23.85 ± 2.87 . more than half, 336 (53.5%) (95%CI: 49.1, 58.1) of the study participants had a good MHL level (Table6).

Table6: The mean score (out of 44 items) in terms of health literacy dimensions among pregnant women attending ANC clinics in Guraghe Zone, Southern Ethiopia, 2021

| MHL dimensions | Mean \pm standard deviation | Adequate (above the mean score) | | Inadequate (below the mean score) | |
|---------------------------------------|-------------------------------|---------------------------------|------|-----------------------------------|------|
| | | Frequency | % | Frequency | % |
| Maternal health Knowledge | 10.11 \pm 1.20 | 412 | 65.6 | 216 | 34.4 |
| Access to maternal health information | 3.01 \pm 1.12 | 395 | 62.9 | 233 | 37.1 |
| Assessment(Comprehension) | 3.30 \pm 1.34 | 332 | 52.9 | 296 | 47.1 |
| Decision making power | 7.42 \pm 1.54 | 295 | 47.0 | 333 | 53.0 |
| Overall MHL | 23.85 \pm 2.87 | 336 | 53.5 | 292 | 46.5 |

Variation in the mean MHL score across the covariates

The mean health literacy level of pregnant women significantly varied across different variables. The variables namely: the level of maternal education, number of pregnancies, number of live children, previous history of ANC, Number of ANC visits for the current pregnancy, enrolment in CBHI scheme, being a model household, and being autonomous in decision making were the variables that show a significant difference in the bivariate analysis at p -value $<$ 0.05. The mean (\pm SD) MHL was 24.67 \pm 2.84 in multigravida and 21.9 \pm 1.74 in primigravida women; this difference in the level of health literacy was statistically significant (p $<$ 0.001). There was also a significant difference in mean MHL among women who enrolled in the CBHI scheme (24.66 \pm 2.76) and who didn't enrol (21.94 \pm 2.58), (p $<$ 0.001) (Table7).

Table7: Variation in the Mean MHL score across different characteristics of pregnant women attending ANC clinics in Guraghe zone, Southern Ethiopia, 2021

| Variables categories | Frequency | Mean of MHL score | Standard deviation | p-value |
|---------------------------------|-----------|-------------------|--------------------|----------------------|
| Age (n=628) | | | | 0.929 ^a |
| <20 | 41 | 23.73 | 2.95 | |
| 20-34 | 491 | 23.87 | 2.82 | |
| ≥30 | 96 | 24.79 | 3.08 | |
| Residence | | | | 0.444 ^b |
| Rural | 368 | 23.84 | 2.83 | |
| Urban | 260 | 23.87 | 2.93 | |
| Marital status (n=628) | | | | |
| Not in marital relationship* | 38 | 23.42 | | 0.929 |
| In marital relationship | 590 | 23.88 | | |
| Mother's education level | | | | <0.001 ^{a*} |
| No formal education | 305 | 23.5 | 2.95 | |
| Primary education | 188 | 23.60 | 2.80 | |
| Secondary education | 77 | 24.15 | 2.75 | |
| College and above | 58 | 25.72 | 1.97 | |
| Husband's education | | | | 0.161 ^a |
| No formal education | 240 | 23.60 | 2.71 | |
| Primary education | 182 | 23.85 | 2.94 | |
| Secondary education | 91 | 24.16 | 3.10 | |
| College and above | 77 | 24.3 | 3.02 | |
| Gravidity (n=628) | | | | <0.001 ^{a*} |
| One | 59 | 21.9 | 1.74 | |
| 2-4 | 348 | 23.66 | 2.85 | |

p-value with ^a indicates descriptive analysis by using One-Way ANOVA

p-value with ^b indicates descriptive analysis by using independent t-test analysis

*indicates a significant difference in the mean MHL across the covariate

| Variables categories | Frequency | Mean of MHL score | Standard deviation | p-value |
|-------------------------------------|-----------|----------------------|--------------------|----------------------|
| ≥5 | 221 | 24.67 | 2.84 | |
| Parity(n=628) | | | | |
| Nulliparous | 59 | 23.24 | 2.74 | 0.025 ^{a*} |
| Primiparous | 96 | 23.36 | 3.12 | |
| Multiparous | 364 | 23.73 | 2.79 | |
| Grand multiparous | 109 | 24.57 | 2.85 | |
| Planning status of pregnancy | | | | |
| Unplanned | 147 | 23.63 | | 0.451 ^b |
| Planned | 481 | 23.92 | | |
| Previous history of ANC | | | | |
| No | 117 | 23.01 | 2.71 | <0.001 ^{b*} |
| Yes | 511 | 24.04 | 2.81 | |
| Current status of ANC visit | | | | |
| 1st visit | 132 | 23.05 | 3.15 | <0.001 ^{a*} |
| 2nd visit | 203 | 23.50 | 2.34 | |
| 3rd visits | 150 | 23.64 | 3.08 | |
| 4th and more visits | 143 | 25.32 | 2.54 | |
| Enrolled in CBHI scheme | | | | |
| No | 187 | 21.94 | 2.58 | <0.001 ^{b*} |
| Yes | 441 | 24.66 | 2.76 | |
| Availability of HEWs | | | | |
| No | 64 | 23.79 | 2.66 | 0.279 ^b |
| Yes | 564 | 23.86 | 2.88 | |

p-value with ^a indicates descriptive analysis by using One-Way ANOVA

p-value with ^b indicates descriptive analysis by using independent t-test analysis

*indicates a significant difference in the mean MHL across the covariate

| Variables categories | Frequency | Mean of MHL score | Standard deviation | p-value |
|-----------------------------------------------------------------------------------------------|-----------|-------------------|--------------------|---------------------|
| Graduated as an MHH | | | | |
| No | 196 | 22.39 | 2.55 | 0.017 ^{b*} |
| Yes | 432 | 24.52 | 2.87 | |
| Autonomy in decision making | | | | |
| Non-autonomous | 110 | 23.64 | 3.35 | 0.026 ^{b*} |
| Autonomous | 518 | 23.89 | 2.76 | |
| p-value with ^a indicates descriptive analysis by using One-Way ANOVA | | | | |
| p-value with ^b indicates descriptive analysis by using independent t-test analysis | | | | |
| *indicates a significant difference in the mean MHL across the covariate | | | | |

Factors associated with maternal health literacy (MHL)

A multiple linear regression model was fitted to identify those variables associated with MHL. Five variables namely; maternal education of college and above, number of pregnancies, ANC frequency, enrolment in CBHI scheme, and being a model household were significantly associated with mean MHL. With controlling to all other four variables, those women with education level of college and above had significantly higher MHL level (β : 1.358; $p < 0.001$). Those women with a high pregnancy order had significantly higher MHL scores (β : 1.439; $p < 0.001$). Respondents who received 4 and more ANC visits also had significantly higher MHL scores (β : 1.418; $p < 0.001$). The mean MHL among women who were graduated as a model household (MHH) was significantly higher as compared to their counterparts (β : 1.681; $p < 0.001$). Also, respondents who were enrolled in the CBHI scheme had a significantly higher SRHL score (β : 2.282; $p < 0.001$). When compared to their counterparts, respondents with a previous history of ANC follow-up had a higher mean MHL by 0.279 scores, although this difference was not statistically significant ($p = 0.069$) (Table 8).

Table 8: A multiple linear regression analysis for factors associated with an MHL among pregnant women attending ANC clinics in Guraghe zone, southern Ethiopia, 2021.

| Variables | MHL | | 95%CI for β | | p-value |
|--------------------------------------------|------------------------|--------------------------|-------------------|-------------|---------|
| | Regression coefficient | Standardized coefficient | Lower limit | Upper limit | |
| | (β) | (β) | | | |
| Attending Secondary education and above | 1.358 | 0.096 | 0.356 | 2.06 | 0.005 |
| Multigravida(≥ 2 pregnancies) | 1.439 ^s | 0.127 | 0.747 | 2.131 | <0.001 |
| Grand multiparous(≥ 5 live children) | 0.093 | 0.003 | -0.679 | 0.692 | 0.675 |
| Previous history of ANC | 0.279 | 0.050 | -0.115 | 0.857 | 0.145 |
| Having 4 and more ANC visits | 1.418 ^s | 0.159 | 0.936 | 1.901 | <0.001 |
| Enrolled in CBHI scheme | 2.282 ^s | 0.316 | 1.641 | 3.523 | <0.001 |
| Graduated as a model household | 1.681 ^s | 0.221 | 0.840 | 2.116 | <0.001 |
| Autonomous in decision making | -0.232 | -0.032 | -0.757 | 0.293 | 0.386 |
| Intercept | 14.96 ^s | | 13.212 | 16.727 | |
| R ² | 0.321 | | | | |
| Observations | 628 | | | | |
| ^s Significant at p-value<0.001 | | | | | |

Discussion

This study aimed at assessing the level of maternal health literacy (MHL) and factors affecting it. In this study, health literacy was measured based on a pretested questionnaire developed from different pieces of literature. The mean literacy level of participants in the study was 23.85 ± 2.87 with a minimum health literacy of 17 and a maximum of 33. More than half, 336 (53.5%) (95%CI: 49.1, 58.1) of the study participants had a good MHL level or above the mean score. According to the findings, a significant number of pregnant women had poor MHL. Comparable pieces of literature were missing because this was the first study of its kind at the country level to measure MHL. By proxy, however, the level of MHL in the current study was lower than studies conducted in Iran, where 98.2% and 61.3% of pregnant women, respectively, had excellent and adequate MHL levels[38]. This could be attributed to differences in respondents' educational status: in the current study, 48.9% of study participants had no formal education, whereas, in the Iranian study, 61% of study participants graduated from high school or

higher[38]. It could also be owing to differences in the study area, with the study in Iran being conducted among women from urban areas, where there is a greater likelihood of acquiring information through media and other sources. On the other hand, the finding was higher than another study conducted in Brazil Iran in which 24.8% and 45.4% of the study participants had adequate health literacy[26, 39]. This could be attributed to differences in study participants and sample sizes, as one of the studies with a 24.8% was conducted among nulliparous women with a small sample size(185).

On the other hand, the finding was higher than other studies conducted in Brazil(20.4%)[40] and Iran in which 24.8% and 45.4% of the study participants had adequate health literacy[41, 42]. This might be due to variation in the study participants and the sample size in which one of those studies with 24.8% was conducted among nulliparous women and with a relatively small sample size(n=185).

Level of education, frequency of ANC visits, Gravidity (number of pregnancies), Being a model household, and enrolment in the CBHI scheme were identified as significant predictors of MHL.

The results of the current study showed that health literacy had a direct relationship with education level. This means that, with an increase in education level, the mean score of the MHL and was in line with the results of studies conducted in Iran[38, 43–45], Brazil[40], and Taiwan[46]. This could be because a woman with a higher educational level is more exposed to different sources of information and has better information access and comprehension skills[38, 47]. Furthermore, this could be explained by the assumption that education is one of the key factors that improve maternal autonomy in decision-making, leading to improved maternal health-seeking behavior and possibly increased MHL[48]. This may strengthen the premise that years of schooling might be associated with a higher level of maternal health literacy. The findings suggest that pregnant women's educational levels play an important role in helping them in deciding when to commence prenatal visits, attend health educational sessions, and attend conferences organized by midwives and nurses[10]. As a result, investing in women's education could be used as a mid-and long-term strategy to improve women's health literacy, and local governments should place a strong emphasis on achieving higher educational levels. In addition, as nearly half of the study participants had no formal education, health care providers (Health extension workers, nurses, and midwives) should urge them to participate in adult education or learning centers in their communities.

Respondents who got adequate ANC of four or more visits had significantly higher MHL scores (β :1.418; $p<0.001$), which was consistent with a study conducted in Brazil and Ghana, and Nigeria, which found that adequate ANC visits improve women's ability to retain, understand, and apply health messages[10, 34, 40, 49]. This could be because women who had more ANC visits had the opportunity to meet with health care providers and discuss maternal and newborn concerns during ANC visits, and all of those interventions could lead to a higher MHL[50].

The current study also revealed that a woman's number of pregnancies is positively associated with having adequate maternal health literacy, which is consistent with findings from a Ugandan and Kenya study that found that women with high pregnancy order had better maternal health literacy than women who were pregnant for the first time[51, 52]. This could be because a woman who has been pregnant

several times had various ANC Visits in her previous pregnancies and could retain information from her experience, resulting in a high MHL. Furthermore, women with high pregnancy orders have a greater level of physical, psychological, social, and self-efficacy, implying they can effectively implement the health information provided to ensure better health outcomes for themselves and their children[52, 53]. Studies also indicate that primigravida women lack the knowledge and motivation to access, comprehend and use available health services for themselves and their children[54].

Women's enrolment status in community-based health insurance (CBHI) scheme was another predictor with a significant relationship to MHL level(β : 2.282; $p < 0.001$). Persons who faced financial difficulties were known to experience major obstacles in navigating the health system and resulted in low health literacy[55]. Despite a lack of data on the relationship between this variable and MHL, a study conducted in the United States (US) found that individuals who were not enrolled in a health insurance scheme had more difficulty finding providers and were more likely to delay or forego needed care, resulting in inadequate health literacy[56]. This could be because once they were enrolled in the CBHI scheme, the agency covered all fees, so they don't have to worry about payment, which enhances their interaction and involvement with community health workers and health facilities[36]. This could improve the chances of getting access, comprehending, and using health information.

Finally, the study revealed that there is an association between maternal health literacy and being a model household ($\beta = 1.681$, $P < 0.001$). This could be because community health workers devote more time to building capacity for those chosen to be model HHs through a 96-hour intensive training program that includes 30 hours on hygiene and environmental sanitation, 42 hours on family health care, and 24 hours on disease prevention and control[57]. That model house should have completed at least 75% of the training, which may pave the way for accessing, comprehending, and practicing suggested health information throughout pregnancy, which tends to improve MHL[37]. Thus, to improve the level of MHL in the current study area, continuous training and home visits for non-model households, as well as follow-up for existing model households, and strengthening the information, education, and communication package are needed.

There were both strengths and shortcomings of this study. There was insufficient evidence on the national level of MHL, and the current study's findings might be used as a reference point for improving maternal and child health at the local and policy levels through a variety of interventions. The lack of studies, particularly in developing countries and at the national level, makes it difficult to compare the study's findings. Because this was a cross-sectional study, no cause-and-effect relationship was reported. Finally, because the study relied on self-reports, there is a chance that social desirability bias was introduced. Even though respondents were given as much time as they needed for a good recall of long-term memory, questions were asked in a specific order, beginning with the present and working backward in time, the possibility of recall bias due to the time elapsed between the event and data collection time should be considered.

Conclusion

The pregnant women in this study had a low level of maternal health literacy, according to the findings. Level of education, frequency of ANC visits, high pregnancy orders, Being a model household, and enrolment in the CBHI scheme were identified as factors that enhance the level of MHL. Local governments should focus their efforts on establishing adult literacy centers in their respective locations, where childbearing age women can improve their reading abilities and get required and relevant information about pregnancy and childbirth. Pregnant women should be encouraged to attend adequate ANC visits, as per health care providers. Finally, at the community level, administrative bodies and health professionals should work on developing a model household and enrolling unenrolled households in the CBHI scheme.

Abbreviations

| | |
|------|----------------------------------------|
| ANC | antenatal care |
| AOR | adjusted odds ratio |
| EDHS | Ethiopia demographic and health survey |
| MHL | maternal health literacy |
| MMR | maternal mortality ratio |

Declarations

Competing interest:

We would like to assure you that, with full responsibility and communication, the document has been submitted. We indicated that there is no conflict of interest with other individuals or organizations that could influence or bias the content of the paper inappropriately.

Funding:

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Authors' Contributions

AH: wrote the proposal, supervised the collection of data, the entry, and analysis of data, and finally engaged in the writing and examination of the manuscript. SD: Participated in the design, methodology, data analysis, and reviewing of the manuscript critically. FA&AG: Participated in the data review and during the study provided critical and progressive suggestions. The final paper was read and approved by all authors.

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Wolkite University, College of Medicine and Health Sciences. A letter of support was obtained from Guraghe zone Health department to the respective health facilities to inform them about the study. After being informed on the study's purpose and method, study participants aged 18 and above gave their written informed consent. Furthermore, consent was obtained from a parent or guardian for those under the age of 18 using standard disclosure protocols. Prior to data collection, participants' privacy and confidentiality were assured. Their right to refuse to participate in the interview, to keep ignoring any or all questions, and to leave at any point was respected.

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Consent to publish

Not applicable

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Figures

Figure1

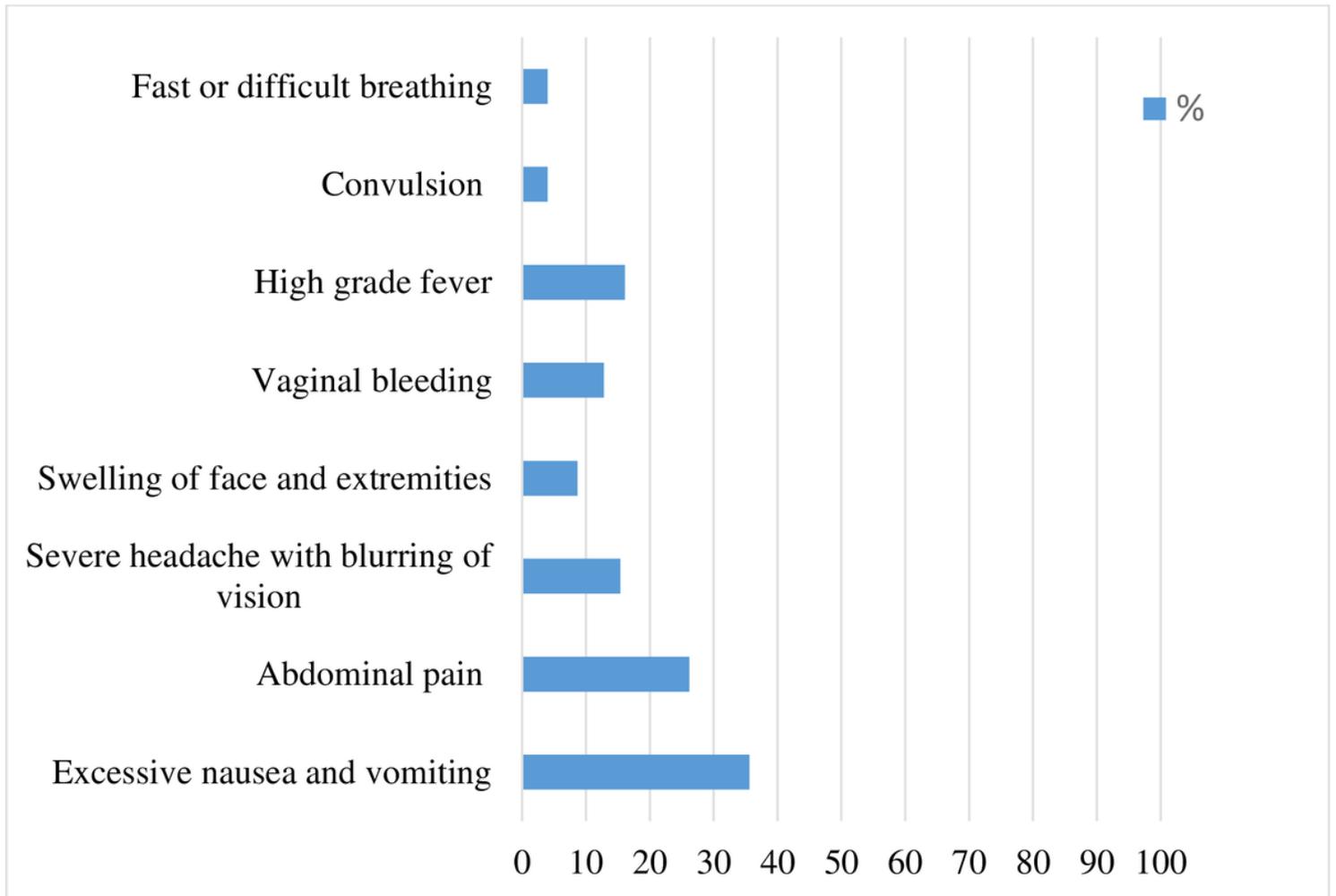


Figure 1

List of reported danger signs during the current pregnancy among respondents in Guraghe zone, Southern Ethiopia, 2021

Supplementary Files

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