

Quantifying Pregnant Women's Knowledge of Educational Components of Antenatal Care in Lesotho

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Abstract

Antenatal care (ANC) literacy is particularly important for pregnant women who need to make appropriate decisions for care during their pregnancy and childbirth. The link between inadequate health literacy on the educational components of ANC and maternal mortality in sub-Saharan Africa (SSA) is undisputable. Yet, little is known about the ANC literacy of pregnant women in SSA, with most studies inadequately assessing the four critical components of ANC literacy recommended by the World Health Organization, namely danger signs in pregnancy; true signs of labour; nutrition; and preparedness for childbirth. Lesotho, a country with one of the highest maternal mortality rates in SSA, is also underexplored in this research area. This cross-sectional study explored the levels of ANC literacy and the associated factors in 451 purposively sampled women in two districts in Lesotho using a structured questionnaire, making recourse to statistical principles. Overall, 16.4 per cent of the participants had grossly inadequate ANC literacy, while 79.8 per cent had marginal levels of such knowledge. The geographic location and level of education were the most significant predictors of ANC literacy, with the latter variable further subjected to post hoc margins test with the Bonferroni correction. The participants had the lowest scores on knowledge of danger signs in pregnancy and true signs of labour. Adequate ANC literacy is critical to reducing maternal mortality in Lesotho. Improving access to ANC education, particularly in rural areas, is recommended. This study also provides important recommendations critical to informing the national midwifery curriculum.

Keywords: antenatal care; antenatal care literacy; health literacy; maternal mortality; pregnancy



Introduction

Health literacy or the degree to which individuals have the capacity to obtain, process and understand basic health information, is indisputably an important determinant of health outcomes (Nutbeam 2008, 2072), including in antenatal care (ANC). ANC literacy is particularly important for pregnant women who need to make appropriate decisions for care during their pregnancy and childbirth. ANC literacy in developing countries remains poorly known, thus curtailing the availability of literature for policies to reduce maternal mortality rates in these countries. However, available evidence reveals that ANC literacy in South Africa, Burkina Faso, Tanzania, Ghana and Ethiopia is low, ranging between 30–50 per cent (Amenu et al. 2016, 1), which implies that less than half of pregnant women in these countries have adequate ANC literacy. With maternal mortality rates per 100 000 live births in the sub-Saharan region ranging between 129 (Botswana) and 1 360 (Sierra Leone) compared to between 3.8 (Finland) and 26.4 (USA) in developed countries (CIA World Factbook 2017; Kassebaum et al. 2016, 1775), the link between low ANC literacy and high maternal rates is therefore compellingly plausible.

The diversity of the reasons for ineffective ANC education in sub-Saharan Africa (SSA) makes national and subnational assessments of ANC literacy imperative. Apparently, the late onset of ANC attendance (Ho and Holroyd 2002, 74), healthcare worker factors, particularly staff shortages and inadequate training, (Von Both et al. 2006, 1), and poor organisation of ANC educational programmes (Ho and Holroyd 2002, 74) are the major reasons behind ineffective ANC education. Other reasons include cultural beliefs (Miltenburg et al. 2017, 273), seeking of maternal services from general practitioners (Moodley 2011, 135), the lack of standard ANC teaching guidelines (Otaiby, Jradi, and Bawazir 2013, 1), and the unavailability of media tools for ANC education (Wilmore et al. 2015, 75).

The World Health Organization (WHO) (2010, 92) emphasises that pregnant women should have basic knowledge of ANC health information. Figure 1, whose content is based on ANC educational components ratified by the WHO (2010, 92), conceptualises a comprehensive scope of core ANC educational components applicable in developing countries. The scope, in a broad sense, outlines the components that are critical for reducing maternal mortality and that are essential for teaching ANC educational components in developing countries.

The scarcity of studies that have evaluated ANC literacy from a wider perspective in SSA implies that the current knowledge on ANC literacy in this region may be based on smaller studies with a narrower scope of assessment. As evidence of this, the demographic health surveys (DHS) of African countries, namely Lesotho, Namibia, South Africa, Swaziland and Zimbabwe show limited coverage of the recommended educational components during ANC teaching sessions and reveal disproportionate focus on knowledge of danger signs (GoL 2016, 125, GoN 2014, 103, GoS 2008, 119,

GoSA 2016, 125, GoZ 2012, 18). The wider scope of assessment, clearly lacking in this region, may provide holistic information useful to inform midwifery curricula particularly in the domain of ANC education.

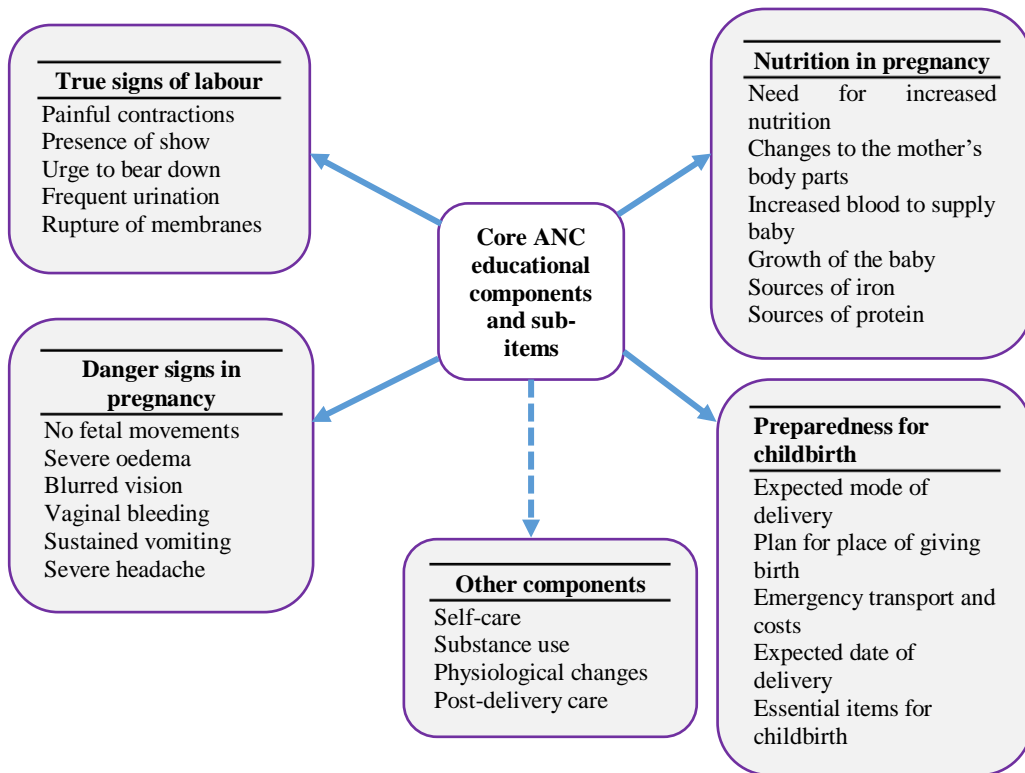


Figure 1: Scope of ANC educational components underpinning ANC literacy. Compiled from WHO (2010, 92)

Lesotho, which has a population of about two million, is a small mountainous country completely within the border of South Africa (GoL 2016, 5). The country has one of the highest maternal mortality ratios in SSA (GoL 2014, 42). With a maternal mortality ratio estimated at 487 per 100 000 in 2015 (GoL 2014, 43), the Government of Lesotho in the 2014 progress report on the Millennium Development Goals (MDGs), reports that Lesotho was off-track in reducing maternal mortality (GoL 2014, 43). To reduce maternal mortality, a raft of measures including improving the coverage of ANC services (GoL 2014, 43) was introduced. However, the scaling up of ANC education was not adequately prioritised. While the corrective measures are commendable, low levels of ANC literacy remain a threat to reducing maternal mortality rates (Guttersrud, Naigaga, and Pettersen 2015, E50). GoL (2014, 43) notes that failure to recognise pregnancy complications and delays in making decisions by pregnant women are major contributing factors to high levels of maternal mortality rates.

The purpose of this study was to assess, based on a scope wider than previous studies, ANC literacy of women attending ANC in Lesotho, and to explore in-depth their ANC knowledge gaps with the overarching aim of informing the national midwifery curriculum.

Problem Statement

The disproportionately higher focus of ANC programmes on the absolute number of antenatal visits compared to the quality of ANC education in Lesotho may be contributing to poor maternal outcomes. Lori et al. (2014, 432) observe that about 80 per cent of maternal mortality could be prevented if the affected mothers had basic health literacy. A situational analysis conducted by the researcher between October 2015 and February 2016 at one of the study sites, which was prompted by the high number of pregnant women presenting for delivery in advanced stages of labour, showed inadequate ANC literacy and apathy of pregnant women towards the true signs of labour and danger signs of pregnancy. Further, about 53 per cent of obstetric records did not reflect evidence of health education to the women during ANC visits as recommended by the obstetric guidelines of Lesotho.

The documented failure by the Government of Lesotho to meet the MDG target of reducing maternal deaths to below 300 deaths per 100 000 live births by 2015 implies that more needs to be done to curtail maternal deaths (GoL 2014, 42), including improving ANC (Guttersrud, Naigaga, and Pettersen 2015, E50). With only 29 per cent of women attending ANC services in rural mountainous areas of Lesotho (GoL 2014, 42), the need for evaluating ANC literacy in these areas and comparing them with the more urbanised setting is compelling.

Purpose of the Study

The purpose of this study was to explore the levels of ANC literacy in Lesotho with the aim of improving delivery of ANC health education and ANC outcomes in the country.

Research objectives of the study were to

- evaluate the levels of ANC literacy in Lesotho,
- identify factors associated with inadequate ANC literacy in Lesotho, and
- identify knowledge gaps in ANC educational components in Lesotho.

Research Questions

- What information do pregnant women in Lesotho have on ANC educational components?
- Which factors are associated with inadequate literacy in Lesotho?

- Which educational components of the ANC literacy need to be strengthened in Lesotho?

Definitions of Keywords

Antenatal care: Tiran (2012, 11) defines ANC as the supervision of pregnant women to protect their health and that of the child.

Antenatal education: Antenatal education is the advice given to pregnant woman at ANC to ensure satisfactory fetal and maternal health (Tiran 2012, 12).

Assessment tool: Assessment tool is a device that educators use to document skills acquisition and educational needs of learners (Billings and Halstead 2016, 387). In this study the assessment tool is a questionnaire designed to assess comprehension of ANC educational components in pregnant women.

Health literacy: Ratzan and Parker (2000, 1) define health literacy as “the level at which an individual has the capacity to obtain, process and understand basic health information and services needed to make proper health decisions”.

Maternal mortality rate: Tiran (2012, 99) states that maternal mortality rate is the number of maternal deaths in a certain area within 42 days of pregnancy termination due to pregnancy and childbirth complications divided by total live births for the same geographic area within a calendar year, multiplied by 100 000.

Research Methods

Study Setting

Lesotho is divided into 10 administrative districts. The health systems of Lesotho consist of tertiary, district referral hospitals, urban filter clinics and rural health centres (Mwase et al. 2010, 11). Accessibility to rural health services in the mountainous regions is problematic. Lesotho’s current (2018) education system, which is important for improving general health literacy levels, consists of seven years of primary education, followed by five years of secondary education and thereafter, tertiary education (GoL 2001, 10). To improve the general literacy levels, Lesotho introduced its free primary educational policy in the year 2000 (Morojele 2012, 38) and notably, free primary education has improved enrolment to levels above 80 per cent from the year 2000.

To improve the geographic coverage of the study, the study was conducted at two hospitals; one in a rural, mountainous area and the other in a peri-urban area of the country. Pregnant women in Lesotho are expected to attend at least four scheduled ANC visits, with the first one expected at 8–12 weeks, while the second visit should occur at 24–26 weeks. The third visit is ideal at 32 weeks while the last one is between 36 and 38 weeks. ANC services in most hospitals of the country entail the provision of antenatal

education by the nurses to all pregnant women in the waiting areas. The antenatal education is mostly presented in lecture format covering nutrition, self-care, danger signs, and signs of labour. Hence each woman receives the identical information regardless of her gestational age.

Research Design

This cross-sectional quantitative study assessed the levels of knowledge on selected ANC educational components and the associated variables among pregnant women using a questionnaire tool developed by the researchers (available on request for lack of space). The tool was divided into two sections, with the first section collecting the participants' biographical and obstetrical data and the second section assessing ANC literacy using short-answer questions.

The short-answer questions comprised four key ANC educational components, namely danger signs in pregnancy, true signs of labour, nutrition, and preparedness for childbirth. The weight and scope of each component were assigned based on the standard guidelines for knowledge assessments (Billings and Halstead 2016, 372). Standard guidelines, peer reviewed midwifery articles and textbooks were used to build the content of the questionnaire. The short-answer section had the scores ranging from 0 to 30. Arbitrarily, inadequate knowledge was defined as failure to obtain a score of at least 50 per cent in the short-answer section of the tool; marginal ANC literacy score ranged from 15 to 24 while a score of 25–30 was defined as high ANC literacy. Notably, the study assessed demographic, economic and obstetric variables that had the potential to influence ANC literacy in Lesotho.

Validation of the Questionnaire

The Delphi method was used to ensure validity of the questionnaire (Keeney, McKenna, and Hasson 2010, 10). The experts were asked to rate each item on the questionnaire for relevance using a five-point scale, with one being “not relevant”, three being “neutral”, and five being “very relevant”. The content validity of the ANC questionnaire was confirmed. All the experts responded that each item on the questionnaire was either relevant or very relevant to test ANC literacy. In addition, the tool was found to have internal consistency reliability (Cronbach's alpha coefficient = 0.9536). Further, the assessment tool was pilot tested with 10 participants at each of the two hospitals before beginning the main data collection after translation to the vernacular language (Sesotho).

Study Population and Sampling

The study population consisted of pregnant women who were attending their first and subsequent ANC visits and who had received ANC education. The study used convenience sampling of all pregnant women attending ANC services stratified by the relative population sizes at the two study sites based on a sampling frame created from

the patients' daily check-up schedules, taking into consideration their willingness to participate in the study and also the selection criteria.

Using the WHO online formula for calculating sample sizes for health surveys (Raosoft 2014) and the target population of 485, assuming an error margin of 5 per cent at a 95 per cent confidence interval and a minimum response rate of 50 per cent, the minimum sample size required was 430 at the two hospitals. An additional 10 per cent was added to increase the reliability of the sampling, which gave a total of 474. This sample was considered reasonably representative for the study population.

Data Collection

Data were collected over three months, between March and May 2017. A total of 500 questionnaires were administered to the study participants during their waiting periods at the hospitals to cater for non-responses and incomplete questionnaires. The participants completed the questionnaires on their own with little assistance of data collectors. A total of 479 questionnaires were collected and data were captured using the Microsoft Access database tool. Of the captured questionnaires, 28 were spoiled or incompletely filled. Thus, 451 valid questionnaires remained and were suitable for analysis.

Data Analysis

The data were cleaned and analysed using the Stata 13 software (StataCorp 2013). Descriptive statistics were applied for the demographic data analysis. The total score from the four ANC educational components was computed electronically. Regarding preparedness for childbirth and nutrition in pregnancy, where the participants had to select correct answers from the given responses, the participants' responses were marked to determine the proportion of participants with low scores on individual responses. This helped to determine the educational components with knowledge gaps. Bivariate and multivariate analyses were performed to identify factors associated with having inadequate ANC literacy. Bivariate analyses were performed using Fischer's exact test and the t-test for categorical and continuous variables, respectively, with inadequate ANC literacy as the outcome variable. Multivariate analyses of the factors that emerged significant ($p < 0.2$) in bivariate analyses were performed based on linear and logistic regression analyses, for continuous and categorical variables, respectively. Furthermore, a post hoc margins test with the Bonferroni correction was run for variables with more than two categories in multivariate analysis (Keppel and Wickens 2004, 111). The cut-off value for significance level in multivariate analysis was set at $p < 0.05$.

Ethical Considerations

The study was approved by the Research Committee of the University of South Africa (UNISA) and permission to conduct the study was granted by the Ethics Committee of

the Ministry of Health, Lesotho, in January 2017. Furthermore, permission to conduct the study was also granted by the authorities of the hospitals included in the study. The researchers explained the purpose of the study and ensured that the participants were comfortable throughout the data collection sessions. The participants' privacy was observed and their information was treated as confidential. The participants were informed of their right to withdraw from the study at any point. Written informed consent was requested and obtained from each participant.

Results

Demographic and Obstetric Characteristics of the Participants

Table 1 presents the demographic and obstetric characteristics of the 451 participants who were included in the final analysis. The childbearing age in the study population ranged from 16 to 47 years with a median of 24 years. The most common, 35 per cent (n = 153), childbearing age group was the 21–25 years group. The 16–20 category, was the second most common, 23 per cent (n = 104) age group. In addition, the proportion of women aged 36 and above, was 8.0 per cent (n = 36). Regarding residential place, more participants, 68.3 per cent (n = 308), resided in the peri-urban areas compared to rural areas, 31.7 per cent (n = 143). Concerning education, most of the women had attained secondary education, 60.7 per cent (n = 274), followed by primary level, 25.9 per cent (n = 117), and tertiary level, 11.1 per cent (n = 50). Only 1.3 per cent (n = 6) had no formal education.

Table 1: Demographic characteristics of the participants

Characteristics	Frequency	Percentage (N = 451)
Marital status		
Married	370	82.0
Never married	75	16.6
Divorced	4	0.9
No response	2	0.5
Family income (monthly average) ^a		
< 1 000	387	85.8
1 000–2 500	37	8.2
2 501–5 000	20	4.4
5 001–8 000	7	1.6
Living arrangements ^b		
Husband	258	57.2
Biological parents	102	22.6
Mother-in-law	58	12.9
Alone	32	7.1
No response	1	0.2

Characteristics	Frequency	Percentage (N = 451)
Residential place		
Peri-urban	308	68.3
Rural	143	31.7
Highest qualification		
Primary	117	25.9
Secondary	274	60.7
Tertiary	50	11.1
No formal education	6	1.3
No response	4	0.9
Obstetric characteristics		
Gravidity		
< = 2	348	77.2
3–4	94	20.8
> = 5	9	2.0
Parity		
0	138	30.6
1–2	259	57.4
3–4	40	8.9
> = 5	8	1.8
No response	6	1.3
Number of miscarriages		
0	184	40.7
1	37	8.2
2	8	2.0
3	2	0.4
No response	220	48.7
Trimester at first ANC visit		
1	204	45.2
2	183	40.6
3	60	13.3
No response	4	0.9
Number of ANC visits		
1–2	134	29.7
3–4	250	55.4
> = 5	66	14.7
No response	1	0.2
Number of ANC educational sessions received		
1–2	205	45.4
3–4	200	44.4
> = 5	46	10.2

Characteristics	Frequency	Percentage (N = 451)
Has a place of delivery been identified?		
Yes	313	69.4
No	133	29.5
No response	5	1.1
Is an emergency transport plan in place?		
Yes	306	67.8
No	139	30.9
No response	6	1.3

^a Maluti currency (about M13.00 = 1 USD)

^b The person staying with the participant at the time of data collection

By proportion, the participants had attended their first ANC in the first, 45.2 per cent (n = 204), second, 40.6 per cent (n = 183), or third, 13.3 per cent (n = 60), trimester. Concerning the number of ANC visits, about half the number of the women (55.4%; n = 250) had attended four or three visits, 29.7 per cent (n = 134) had appeared twice or less for ANC, while 14.7 per cent (n = 66) had attended more than five visits.

Importantly, all the women had received at least one ANC health educational session, with 45.4 per cent (n = 205) having received 1–2 educational sessions, while 44.4 per cent (n = 200) had been taught 3–4 times. Only 10.2 per cent (n = 46) had received more than five sessions. Regarding birth preparedness, about a third (29.5%; n = 133) had not identified a place of giving birth yet. In addition, 31.2 per cent (n = 139) did not have an emergency transport plan for delivery.

ANC Literacy Assessment Outcomes of the Participants and the Associated Factors

ANC Literacy Outcomes by ANC Educational Component

Table 2 presents the participants' performance on ANC educational components. Of concern was that 36.1 per cent (n = 163) of the women did not know that a pregnant woman should be aware of the expected mode of delivery, 24.2 per cent (n = 109) were not aware that identifying a place of giving birth as well as the expected date of delivery, 21.7 per cent (n = 98), signify preparedness for childbirth.

Regarding the reasons for increased nutrition during pregnancy, the item with the highest proportion of incorrect scores was the changes to the mother's body parts, 42.6 per cent (n = 142), followed by increased blood needed to supply the baby, 20.6 per cent (n = 93), and the growth of the baby, 9.1 per cent (n = 41). On the same topic, most of the participants, 50.5 per cent (n = 228), did not know that peas were examples of bodybuilding foods, and 30.6 per cent (n = 138) did not know that livers were bodybuilding food, followed by 17.5 per cent (n = 79) who did not know that eggs were

bodybuilding food. In relation to the sources of iron, the item with the highest proportion of incorrect scores was eggs, 43.9 per cent (n = 198), while livers had a lower proportion of incorrect scores, 16.6 per cent (n = 175).

Of the four components, knowledge of preparedness for childbirth (mean = 77.3%) and nutrition in pregnancy (mean = 74.3%) had the highest performance. Knowledge of danger signs in pregnancy had the worst performance with the overall percentage mean of 38.3 per cent, followed by knowledge of true signs of labour, 55.6 per cent.

Table 2: Participants’ scores on ANC educational components

ANC educational component and sub-items	Percentage overall mean ± SD (correct responses)	Frequency of incorrect score (%) on sub-items N = 451 (100%)
Knowledge of preparedness for childbirth	77.3% ± 19.9	
Expected mode of delivery		163 (36.1)
Identified a place of giving birth		109 (24.2)
Available emergency transport and costs		108 (23.9)
Expected date of delivery		98 (21.7)
Packed essential items needed for childbirth		34 (7.5)
Knowledge of nutrition in pregnancy	74.3% ± 17.2	
Knows reasons for increased nutrition		
Changes to the mother’s body parts		192 (42.6)
Increased blood to supply the baby		93 (20.6)
Growth of the baby		41 (9.1)
Knows bodybuilding foods		
Peas		228 (50.5)
Liver		138 (30.6)
Eggs		79 (17.5)
Beans		58 (12.9)
Milk		57 (12.6)
Knows sources of iron		
Eggs		198 (43.9)
Liver		75 (16.6)
Knowledge of danger signs in pregnancy*	38.3% ± 21.7	

ANC educational component and sub-items	Percentage overall mean \pm SD (correct responses)	Frequency of incorrect score (%) on sub-items N = 451 (100%)
Knowledge of true signs of labour*	55.6% \pm 17.6	

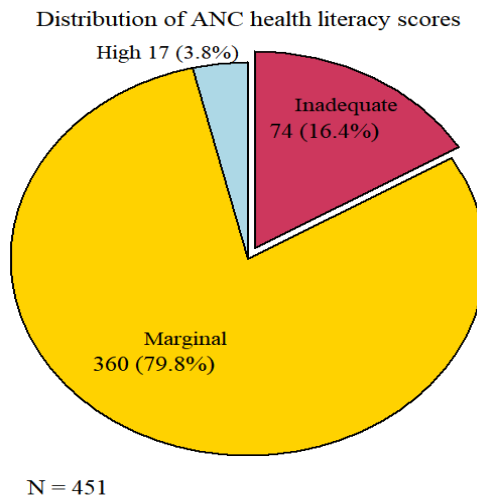
* Participants were asked to list ten correct danger signs in pregnancy and five true signs of labour, therefore these components had no sub-items.

SD = standard deviation of the mean

ANC Literacy Scores of the Participants

The literacy scores ranged from 3 to 28 with a mean score of 17.9. Although the literacy scores were marginally ($p = 0.045$) positively skewed, the Shapiro-Wilk test for normality revealed that the literacy scores were normally distributed ($p = 0.194$).

Figure 2 presents the distribution of ANC literacy scores. By proportion, the majority, 79.8 per cent ($n = 359.8$) of the participants had marginal ANC literacy, 16.4 per cent ($n = 74$) had inadequate ANC literacy, while only 3.8 per cent ($n = 17.2$) had high ANC literacy.



Note: Total ANC literacy score = 30; Inadequate score ≤ 15 ; marginal score = 15 to 24, high score = 25 to 30.

Figure 2: Distribution of ANC literacy scores

Associations between Inadequate ANC Literacy and Women's Characteristics

Table 3 illustrates the association between women's characteristics and inadequate literacy levels. In bivariate analyses, only three characteristics, age ($t = 2.052$; 0.041),

geographic location (Chi2 = 41.4; $p = 0.000$), and highest educational qualification attained (Chi2 = 24.0; $p = 0.000$) were significant. The mean age of participants with inadequate literacy was significantly higher ($p = 0.041$) than that of the participants with adequate literacy (26.7 versus 25.2). In addition, the proportion of women with inadequate ANC literacy decreased with the level of education attained; those with no formal education had the highest proportion, 33.3 per cent (2 out of 6 participants with no formal education), while having tertiary education was associated with the smallest proportion, 8.0 per cent (4 out of 50). Proportionally, more women with inadequate ANC literacy were from the rural geographic area, 32.9 per cent (47 out of 143), compared to the peri-urban area, 8.8 per cent (27 out of 308).

However, despite being insignificant ($p > 0.050$), two characteristics, namely the number of ANC health educational sessions received (Chi2 = 3.6; $p = 0.162$) and gravidity (Chi2 + 4.3; $p = 0.117$), had considerable associations with ANC literacy. Only a small proportion of women, 8.7 (4 out of 46), who had received ANC health education more than five times and a minor proportion of women (4.7%; 51 out of 348) who had 1–2 gravidity had inadequate ANC literacy signifying the influence of these two variables.

In multivariate analyses, the rural geographic location ($p = 0.000$) was also associated with inadequate ANC literacy (see Table 3). In addition, the primary educational level ($p = 0.004$) emerged as a significant predictor of having inadequate ANC literacy in multivariate logistic regression and the post hoc margins test with the Bonferroni correction for multiple categories. Women with no formal education ($OR = 5.8$) and those from rural geographic locations ($OR = 5.1$) had higher odds ratios of having inadequate ANC literacy compared with their counterparts. However, age ($p = 292$) and the number of ANC educational sessions received ($p = 0.262$) were not significant.

Table 3: Associations between inadequate ANC literacy and women’s characteristics

Characteristics	Adequate N (%); N = 377	Inadequate N (%); N = 74	Chi2/t (p- value)	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P- value
Age*, mean (95% CI)	25.2 (24.6– 25.7)	26.7 (25.1– 28.3)	2.052 (0.041)	0.006 (–0.000– 0.012)	0.064	0.003 (–0.002– 0.009)	0.292
Family income, mean (95% CI)*	519.5 (396.8– 642.1)	497.3 (242.1– 752.5)	0.708 (0.884)	Excluded ^β			
Geographic location			41.4 (0.000)				
Peri-urban	281 (91.2)	27 (8.8)		1		1	
Rural	96 (67.1)	47 (32.9)		5.1 (3.0– 8.6)	0.000	4.3 (2.5– 7.5)	0.000

Characteristics	Adequate N (%); N = 377	Inadequate N (%); N = 74	Chi2/t (p- value)	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P- value
Number of ANC visits			3.4 (0.337)	Excluded ^β			
1–2	1.9 (81.3)	25 (18.7)					
3–4	207 (82.8)	43 (17.2)					
≥ 5	60 (90.9)	6 (9.1)					
No response	1 (100.0)	0 (0.0)					
Number of ANC educational sessions ^γ received			3.6 (0.162)				
≥ 5	42 (91.3)	4 (8.7)		1		1	
3–4	161 (80.5)	39 (19.5)		2.5 (0.9– 7.5)	0.091	2.7 (0.8– 8.5)	0.096
1–2	174 (84.9)	31 (15.1)		1.9 (0.6– 5.6)	0.262	2.3 (0.7– 7.4)	0.174
Gravidity			4.3 (0.117)	Excluded ^β			
1–2	297 (85.3)	51 (14.7)					
3–4	74 (78.7)	20 (21.3)					
≥ 5	6 (66.7)	3 (33.3)					
Educational level			24.0 (0.000)				
Tertiary	46 (92.0)	4 (8.0)		1		1	
Secondary	241 (88.0)	33 (12.0)		1.6 (0.5– 4.7)	0.412	1.4 (0.5– 4.3)	0.544
Primary	82 (70.1)	35 (29.9)		4.9 (1.6– 14.7)	0.004	3.2 (1.0– 9.9)	0.049
No formal education	4 (66.7)	2 (33.3)		5.8 (0.7– 41.7)	0.084	5.1 (0.6– 40.9)	0.125

* The significance of the associations between two continuous variables, age and average family income, were tested using a t-test while the rest were tested using Fischer’s exact test.

^βThe characteristic was not included in multivariate analysis because of an insignificant p-value in univariate analysis.

^γ Within the variables “number of ANC educational sessions received” and “educational level”, the participants who had received three to four ANC educational sessions and those with primary level education had the highest proportion of inadequate ANC literacy with the post hoc margins test, respectively, but only those with primary level education had statistically higher proportions of inadequate literacy than other groups within this variable with the Bonferroni correction for multiple categories.

Discussion

Characteristics of Participants

The wide spectrum of the childbearing age in the study population has critical implications, including that the risky childbearing age below 18 emphasises the need for improved health education in young girls about the risks of underage pregnancy,

including cephalopelvic disproportion and high blood pressure (Fraser and Cooper 2009, 18–19). Similarly, the existence of pregnancies in older women needs attention during ANC educational sessions.

The late onset of ANC common in this study warrants further investigations into the possible causes of the maternal apathy towards ANC in Lesotho. Patel, Rupani, and Patel (2013, 9), in a study conducted in India, observe that the late onset of ANC remains a challenge in developing countries. In this vein, the WHO (2016, 40) reiterates the need for developing countries to deal with late ANC attendance.

ANC Literacy Outcomes and Associated Factors

A considerable proportion of pregnant women in rural Lesotho has marginal and inadequate ANC literacy. This finding necessitates the need to scale up ANC health education in the country. To solve the problem of maternal mortality in Lesotho, ANC literacy needs to be recognised as a major component of quality ANC services. There is also a need for increased prioritisation of ANC literacy in the national nursing curriculum, particularly the ANC modules and midwifery research agenda. Relevant authorities driving health and education aspects in the country need to take the matter of inadequate health literacy seriously, given that health literacy transcends many other determinants of health outcomes (Annarumma and Palumbo 2016, 611).

The geographic location and level of education were the most influential factors associated with inadequate ANC literacy. The significantly lower ANC literacy levels of the rural women compared to their urbanised counterparts are testimony to the significance of the mountainous terrain as a natural barrier to ANC health education. Wolf, Gazmararian, and Baker (2005, 1947) assert that individuals living in rural communities lack adequate health services that are essential for improving health. Therefore, better availability of ANC education in rural Lesotho is needed.

Increasing the number of health centres and health workers is one of the critical interventions required. Apparently, the recently renovated (2009–2013) health centres in the rural areas of the country may not be effective enough. The barriers to the effectiveness of health centres in enhancing ANC literacy need to be further investigated, in particular the time constraints and shortage of equipment for enhancing the teaching of ANC educational components. Perlow (2010, 123) recognises the accessibility to services as the global gateway to dealing with global health literacy disparities.

The low levels of education were associated with low ANC literacy in the study. The participants with no formal education were five times more likely to have low ANC literacy than their counterparts. This implies that there is a need to improve the levels of education of women particularly in the rural areas. Without other interventions, the free primary education policy in Lesotho may be inadequate to improve health literacy.

Kateja (2007, 29) emphasises that better literacy in women is critical for their quality of health. Therefore, there is a need for more interventions to improve ANC literacy.

The lack of a significant relationship between health literacy and the number of ANC health educational sessions received may suggest the need to review the effectiveness of current ANC teaching methods. In a study conducted in Uganda, Conrad et al. (2012, 619) also emphasise the need to review the effectiveness of ANC teaching methods in the nursing curricula. Further studies may be needed to review the teaching methods for ANC in the current midwifery curriculum, particularly teaching approaches for women with low levels of education.

The worst performing ANC educational components in this study were the knowledge of danger signs in pregnancy and the knowledge of the true signs of labour. These two components, clearly linked to maternal mortality, may be the major contributing factors to maternal deaths in Lesotho. Poor knowledge of the true signs of labour may be one of the potential causes of home deliveries, a practice common in the country. Incidentally, the proportion of home deliveries in Lesotho is estimated at 23 per cent (GoL 2016, 126).

Despite the knowledge of nutrition being one of the better performing components in the study, knowledge of bodybuilding foods and sources of iron, which are critical during pregnancy, was weak. For example, one third of the women did not know that livers were a source of iron. This stresses the need for more emphasis on these nutritional components during ANC educational sessions. Notably, iron deficiency is the leading cause of anaemia during pregnancy in Lesotho (Mugomeri, Musa, and Chatanga 2016, 10), and is a specific risk factor for adverse maternal outcomes.

Conclusions and Recommendations

A considerable proportion of women in Lesotho has inadequate ANC literacy. The main factors associated with low ANC literacy were the geographic location and educational level. To deal with these challenges, health systems and education policies need to be strengthened. The health systems policy needs to improve access and quality of health services at rural health centres. Given the connection between health literacy and the empowerment of women (Cron Dahl and Eklund Karlsson 2016, 1), the study recommends the introduction of ANC literacy projects that reach women at the actual literacy level to ensure that in the short term the pertinent messages reach all women. In the long term, policymakers may need to draft suitable policies and guidelines that support secondary and higher education to empower the literacy levels of women.

There is a need to assess the effectiveness of the current ANC teaching tools such as the teaching guide and approach regarding ANC educational sessions. One potential solution to the problem of poor knowledge of ANC educational components is to assess the utility and practicality of incorporating ANC literacy screening into a maternal

assessment as advocated by Sand-Jecklin, Daniels, and Lucke-Wold (2017, 176). This has a potential to improve maternal ANC literacy.

In addition, there is a need for increased prioritisation of ANC literacy in the national nursing curriculum, particularly the ANC modules and midwifery research agenda. This study recommends the increasing of content on ANC educational components on radio stations.

More quantitative studies are needed for benchmarking. To date, the only comparable study, conducted in Ghana by Lori et al. (2014), used a qualitative approach to assess ANC literacy of pregnant women. In addition, future research should focus on the impact of ANC literacy on health outcomes.

Limitations

The extent to which the study can be generalised is limited owing to potential sampling bias and representativeness of the study sample. Sampling in the peri-urban and rural settings without including the urban setting deprived the study of a comparative group. A population-based survey on ANC literacy, which is rare in Lesotho, may be needed.

The study only looked at associations between participants' characteristics and ANC literacy, and as a result, associations reported in this study do not imply causation.

The fact that a new questionnaire for assessing ANC literacy was developed for this study may not be without challenges. For example, the use of an arbitrary cut-off value for defining inadequate health literacy was another notable limitation of this study. In addition, the questionnaire may have left out other components of ANC health education. Nevertheless, the strength of this study is that it highlights the inadequacy of ANC health literacy in pregnant women, which underscores the need for an intensive review of the current ANC education in Lesotho.

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References

- Amenu, Gedefa, Zerfu Mulaw, Tewodros Seyoum, and Hinselmu Bayu. 2016. "Knowledge about Danger Signs of Obstetric Complications and Associated Factors among Postnatal Mothers of Mechekel District Health Centers, East Gojjam Zone, Northwest Ethiopia, 2014." *Scientifica* 2016. <https://doi.org/10.1155/2016/3495416>.
- Annarumma, Carmela, and Rocco Palumbo. 2016. "Contextualizing Health Literacy to Health Care Organizations: Exploratory Insights." *Journal of Health Management* 18 (4): 611–24. <https://doi.org/10.1177/0972063416666348>.

- Billings, D. M., and J. A. Halstead. 2016. *Teaching in Nursing: A Guide for Faculty*. St Louis: Elsevier.
- CIA World Factbook. 2017. *Maternal Mortality Rate 2017 Country Ranks, By Rank*. Accessed 4 March 2018.
https://photius.com/rankings/2017/population/maternal_mortality_rate_2017_0.html.
- Conrad, Paul, Manuela de Allegri, Arinaitwe Moses, Elin C. Larsson, Florian Neuhann, Olaf Müller, and Malabika Sarker. 2012. "Antenatal Care Services in Rural Uganda: Missed Opportunities for Good-Quality Care." *Qualitative Health Research* 22 (5): 619–29. <https://doi.org/10.1177/1049732311431897>.
- Cron Dahl, Kristine, and Leena Eklund Karlsson. 2016. "The Nexus between Health Literacy and Empowerment: A Scoping Review." *Sage Open* 6 (2): 1–7.
<https://doi.org/10.1177/2158244016646410>.
- Fraser, D. M., and M. A. Cooper. 2009. *Myles' Textbook for Midwives*. St. Louis: Elsevier.
- GoL (Government of Lesotho). 2001. *Free Primary Education Programme 2001*. Maseru: Ministry of Education and Training.
- GoL (Government of Lesotho). 2014. *Millennium Development Goals Status Report 2013*. Government of Lesotho. Accessed 8 November 2016.
<http://www.ls.undp.org/content/dam/lesotho/docs/Reports/MDG%20Report%20-%202013.pdf>.
- GoL (Government of Lesotho). 2016. *Lesotho Demographic and Health Survey 2014*. Government of Lesotho. Accessed 20 June 2017.
<https://dhsprogram.com/pubs/pdf/FR309/FR309.pdf>.
- GoN (Government of Namibia). 2014. *Namibia – Demographic and Health Survey 2013*. Ministry of Health and Social Services and Namibia Statistics Agency. Accessed 14 July 2017. <https://dhsprogram.com/pubs/pdf/FR298/FR298.pdf>.
- GoS (Government of Swaziland). 2008. *Swaziland – Demographic and Health Survey 2006–07*. Central Statistics Office and Macro International. Accessed 20 June 2017.
<http://dhsprogram.com/pubs/pdf/fr202/fr202.pdf>.
- GoSA (Government of South Africa). 2016. *South Africa Demographic Health Survey*. Pretoria: Statistics South Africa.
- GoZ (Government of Zimbabwe). 2012. *Zimbabwe – Demographic and Health Survey 2010–11*. Zimbabwe National Statistics Agency and ICF International. Accessed 14 July 2017.
<http://www.dhsprogram.com/pubs/pdf/FR254/FR254.pdf>.

- Guttersrud, Øystein, Alice Sandra Naigaga, and Kjell Sverre Pettersen. 2015. "Measuring Maternal Health Literacy in Adolescents Attending Antenatal Care in Uganda: Exploring the Dimensionality of the Health Literacy Concept Studying a Composite Scale." *Journal of Nursing Measurement* 23 (2): E50–E66. <https://doi.org/10.1891/1061-3749.23.2.50>.
- Ho, Irene, and Eleanor Holroyd. 2002. "Chinese Women's Perceptions of the Effectiveness of Antenatal Education in the Preparation for Motherhood." *Journal of Advanced Nursing* 38 (1): 74–85. <https://doi.org/10.1046/j.1365-2648.2002.02148.x>.
- Kassebaum, N. J., R. M. Barber, Z. A. Bhutta, L. Dandona, P. W. Gething, S. I. Hay, Y. Kinfu, H. J. Larson, X. Liang, S. S. Lim, and A. D. Lopez. 2016. "Global, Regional, and National Levels of Maternal Mortality, 1990–2015: A Systematic Analysis for the Global Burden of Disease Study 2015." *Lancet* 388 (10053): 1775–812. [https://doi.org/10.1016/S0140-6736\(16\)31470-2](https://doi.org/10.1016/S0140-6736(16)31470-2).
- Kateja, Alpana. 2007. "Role of Female Literacy in Maternal and Infant Mortality Decline." *Social Change* 37 (2): 29–39. <https://doi.org/10.1177/004908570703700202>.
- Keeney, S., H. McKenna, and F. Hasson. 2010. *The Delphi Technique in Nursing and Health Research*. New York: Wiley.
- Keppel, G., and T. D. Wickens. 2004. "Simultaneous Comparisons and the Control of Type I Errors." In *Design and Analysis: A Researcher's Handbook*. 111–30. 4th ed. Upper Saddle River: Pearson.
- Lori, Jody R., Chin Hwa Y. Dahlem, Jacqueline V. Ackah, and Richard M. K. Adanu. 2014. "Examining Antenatal Health Literacy in Ghana." *Journal of Nursing Scholarship* 46 (6): 432–40. <https://doi.org/10.1111/jnu.12094>.
- Miltenburg, Andrea Solnes, Yadira Roggeveen, Jos Roosmalen, and Helen Smith. 2017. "Factors Influencing Implementation of Interventions to Promote Birth Preparedness and Complication Readiness." *BMC Pregnancy and Childbirth* 17 (1): 270. <https://doi.org/10.1186/s12884-017-1448-8>.
- Moodley, Jagidesa. 2011. "Hypertensive Disorders in Pregnancy and the General Practitioner: A Vignette and Lessons to Learn." *South African Family Practice* 53 (2): 135–7. <https://doi.org/10.1080/20786204.2011.10874072>.
- Morojele, Pholoho. 2012. "Implementing Free Primary Education in Lesotho: Issues and Challenges." *Journal of Social Sciences* 32 (1): 37–45. <https://doi.org/10.1080/09718923.2012.11893050>.
- Mugomeri, E., N. K. Musa, and P. Chatanga. 2016. "Haemoglobin Response to Routine Iron and Folate Supplementation during Pregnancy in an HIV-Endemic Rural Area of Roma, Lesotho." *Medical Technology SA* 30 (1): 10–14. <https://hdl.handle.net/10520/EJC193814>.

- Mwase, Takondwa, Eddie Kariisa, Julie Doherty, Nomaphuthi Hoothlo-Khotle, Paul Kiwanuka-Mukiibi, and Taylor Williamson. 2010. *Lesotho Health Systems Assessment 2010*. Bethesda: Health Systems 20:20.
- Nutbeam, Don. 2008. "The Evolving Concept of Health Literacy." *Social Science and Medicine* 67 (12): 2072–78. <https://doi.org/10.1016/j.socscimed.2008.09.050>.
- Otaiby, Tahani Al, H. Jradi, and A. Bawazir. 2013. "Antenatal Education: An Assessment of Pregnant Women Knowledge and Preferences in Saudi Arabia." *Journal of Women's Health Care* 2 (4): 1–5. <https://doi.org/10.4172/2167-0420.1000139>.
- Patel, Prakash, B. Mihir Prafulbhai Rupani, and Swati S. Patel. 2013. "Antenatal Care Registration and Predicting Factors of Late Registration among Pregnant Women." *Tropical Doctor* 43 (1): 9–12. <https://doi.org/10.1177/0049475513480772>.
- Perlow, Ellen. 2010. "Accessibility: Global Gateway to Health Literacy." *Health Promotion Practice* 11 (1): 123–31. <https://doi.org/10.1177/1524839908321942>.
- Raosoftware. 2014. *Sample Size Calculator*. Accessed 28 November 2014. <http://www.raosoftware.com/samplesize.html>.
- Ratzan, S. C., and R. M. Parker. 2000. *National Library of Medicine Current Bibliographies in Medicine: Health Literacy*. Bethesda: National Institutes of Health.
- Sand-Jecklin, Kari, Christine S. Daniels, and Noelle Lucke-Wold. 2017. "Incorporating Health Literacy Screening into Patients' Health Assessment." *Clinical Nursing Research* 26 (2): 176–90. <https://doi.org/10.1177/1054773815619592>.
- StataCorp. 2013 *Stata Statistical Software: Release 13*. College Station: StataCorp LP.
- Tiran, D. 2012. *Baillière's Midwives' Dictionary*. 11th ed. St. Louis: Elsevier.
- Von Both, Claudia, Steffen Fleßa, Ahmad Makuwani, Rose Mpembeni, and Albrecht Jahn. 2006. "How much Time do Health Services Spend on Antenatal Care? Implications for the Introduction of the Focused Antenatal Care Model in Tanzania." *BMC Pregnancy and Childbirth* 6 (1): 22. <https://doi.org/10.1186/1471-2393-6-22>.
- WHO (World Health Organization). 2010. *Counselling for Maternal and Newborn Health Care: A Handbook for Building Skills*. Geneva: World Health Organization.
- WHO (World Health Organization). 2016. *WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience*. Accessed 23 January 2017. <http://apps.who.int/iris/bitstream/10665/250796/1/9789241549912-eng.pdf>.
- Wilmore, M., D. Rodger, S. Humphreys, V. L. Clifton, J. Dalton, M. Flabouris, and A. Skuse. 2015. "How Midwives Tailor Health Information used in Antenatal Care." *Midwifery* 31 (1): 74–79. <https://doi.org/10.1016/j.midw.2014.06.004>.

Wolf, Michael S., Julie A. Gazmararian, and David W. Baker. 2005. "Health Literacy and Functional Health Status among Older Adults." *Archives of Internal Medicine* 165 (17): 1946–52. <https://doi.org/10.1001/archinte.165.17.1946>.