Health Literacy, Information Seeking Patterns and Perceived Outcomes among Pregnant Women in Two Districts of Tanzania

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Research Article

Keywords: health literacy, maternal health outcomes, information seeking behavior, Tanzania

DOI: https://doi.org/10.21203/rs.3.rs-156717/v1

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Abstract

Background

Pregnant women that engage in information seeking process are more likely to have a high level of knowledge about their health, be confident to discuss their health concerns with their health care providers and report better health promotion activities than individuals who do not seek health information. However, health literacy influence pregnant women's information seeking behaviours and consequently their health knowledge and health outcomes. Limited studies have explored the effects of health literacy on the outcomes associated with the information seeking among pregnant women in Tanzania. This study investigates the relationship between health literacy and information seeking patterns and its associated outcomes among pregnant women in Tanzania.

Methods

A cross-sectional survey was conducted among 260 pregnant women aged 18 and above attending selected antenatal clinics (ANC) in Tanzania. Health literacy was assessed using a REALM-SF instrument while information seeking patterns while the associated outcomes were measured using three Likert scales. Descriptive and analytic analyzes were performed using the SPSS, version 24.

Results

Among the demographic factors, level of education was significantly associated with the level of health literacy (p<0.001). The level of health literacy was better among married pregnant women than those who were not married, and among those who have high income more than those with low-income. The number of ANC visits, gestational age and parity were significantly associated with the level of health literacy (p<0.05). A significant relationship was found between health literacy with seeking health information from village leaders (p < 0.0001) and all online information sources (p < 0.05). Pregnant women with high level of health literacy strongly agree to confirm (from health professionals) the validity of health information they receive from different sources and to recommend the importance of searching health information to others (p<0.001).

Conclusion

Health literacy has great influence on maternal health behaviors and the associated outcomes. Maternal health interventions targeting both individual women and the public to ensure high health literacy levels across communities are required. An integration of online/ web-based health information in ANC health educational packages would warrant pregnant women access to high quality health information.

Introduction

Pregnant women that engage in information seeking process are more likely to have high level of knowledge about their health, be confident to discuss their health concerns with their health care providers and report better health promotion activities than individuals who do not seek health information (1, 2).

Research found that access to pregnancy-related information to low-income women is positively associated with birth weight (3), term (4), and survivability of the child (5). In the context of this study, information seeking refers to "a conscious effort to acquire information in response to a need or gap in your knowledge" (6). This information may either be obtained by chance or serendipitity, or when individuals share information that they perceive is useful to them (6). In reality, health literacy is a significant factor in improvement of information seeking process among pregnant women and healthcare providers and orientation towards a healthcare system (7).

Health literacy can influence pregnant women's information seeking and consequently their health knowledge and health outcomes. Health literacy consist the knowledge, motivation and competencies of seeking, understanding, evaluating and applying health-related information within healthcare, disease prevention and health promotion settings (8). People with low health literacy may be misled to incorrect health information sources and face difficulties in seeking health information (9). Low health literacy has been related with lower health outcomes and poorer use of patient care services (9, 10). A recent systematic review reported that health literacy interventions led to improvements in knowledge, health behaviours, fetal outcomes and health-service utilization (10). Another systematic review found that the health literacy relates to reproductive health knowledge and consequently, specific health behaviors of pregnant women, such as prenatal vitamin use and breast-feeding (11). Research also shows that pregnant women with high health literacy received preconception counseling, had regular health checks and used folic acid, and were physically active more than three days a week (12). Indications are that raising the level of health literacy of the pregnant women provides the opportunity for improving their information seeking behaviour and consequently the development of their ability to potentially overcome health-related processes throughout their lives.

The level of health literacy is highly associated with demographic characteristics such as education and age. For instance, several studies found that the level of education affected the health literacy among adults in rural and urban areas (13) and pregnant women (7, 14, 15). (7) also reported a significant relationship between health literacy and age pregnant women in Iran. The level of health literacy of pregnant women is also affected by obstetric factors such as number of ANC visits, gestational age and number of parities (14). Pregnant women who are better educated, older, with multiple parities, high number of ANC visits and gestational age are more likely to have adequate health literacy as compared to their counterparts. These findings necessitate for a need for appropriate maternal health education to promote the health literacy level and to empower pregnant women.

The influence of health literacy on information seeking behavior of pregnant women has been extensively explored in several studies. One study found that health literacy was not significantly associated with how pregnant women used to seek information from various sources, including books, brochures, television, and the internet (Shieh, Broome, and Stump 2010). In another study however, (16) found that pregnant women with low health literacy were less likely to seek health information from the internet, and more likely to have self-efficacy barriers as compared to the participants with high level of health literacy in USA. These studies however did not vary in terms of their quality assessment. In broad context, a recent systematic review reported that individuals...
with low health literacy were less likely to use computers and internet technology in most studies or obtain information from multiple sources in two studies (17). Similarly, another study found that patients with adequate level of health literacy have been reported to seek health information from multiple sources of information (18). Consistent with other studies, (19) found that patients with functional health literacy identified several health information sources. It is clear that pregnant women with adequate health literacy seek information from multiple sources, including online information sources such as internet. Hence, equitable health literacy and adequate health-information seeking is an important factor for maternal health care system.

On the online information seeking behaviour, research indicates that people with lower health literacy were more likely to trust on information from internet sources (i.e. social media, blogs), friends and pharmaceutical companies but less likely to trust information from health workers (20). However, regardless of health literacy, research indicates that pregnant women prefer to obtain health information through a face-to-face communication with their health care providers (19, 21). It is fundamental to note that the higher trust of social media and blogs suggests that some people with low health literacy could not be accessing the best health information that could affect their health outcomes. It is therefore important to have public health interventions targeting pregnant women and the general public to build their health literacy in order to evaluate the quality of health information before consumption. Multiple means are required in “plain, clear language that reinforces patients’ understanding and application of information to health behavior” (19).

Low health literacy may affect pregnant women information needs, and their ability to search, understand and utilize maternal health information leading to inadequate preventive behaviors, unsafe self-care and chronic disease management, and increased medical costs (Shieh, Broome, and Stump 2010). Another study found that low health literacy was negatively related to the ability to appraise and trust online health information (22). Various studies in Tanzania showed that although the information gets to the rural communities, most of them are not able to utilize it properly due to low level of health literacy (23, 24). Indications are that pregnant women with low health literacy are more likely to seek and access low quality health information that might affect their health outcomes. Assessment of health literacy and its effects on information seeking behaviour is critical for the development of health interventions and provision of high-quality context specific prenatal care to pregnant women.

In Sub-Saharan Africa, information seeking behaviours of pregnant women have been studied more widely (25–31), with little attention to the effects of low health literacy. A systematic review by (32) found that pregnant women used the Internet as a source of information about pregnancy in most studies although the individual studies did not consider the role of low health literacy. It is obvious that there are inadequate studies that have explored the effects of low health literacy on the outcomes associated with the information-seeking. Hence, the effects of health literacy on the information-seeking behaviour of pregnant women are not quite so well addressed especially in sub-Saharan Africa. This study intends to fill the gap by investigating the relationship between health literacy and information seeking patterns and its associated outcomes among pregnant women in two districts of Tanzania.

**Methods**

**Setting**

The study conducted questionnaire survey in two Antenatal clinics, in Kilimanjaro and Pwani regions. The study areas differ in terms of maternal mortality rate (MMR), and access to information and communication facilities. Pwani is among the regions with high MMR in Tanzania, with maternal mortality ratio of 687, and one third of women (38.4%) accessed radio at least once a week, as compared to television (20.0%) and newspaper (14.4%) according to 2012 Census. Additionally, most women owned a mobile phone (62.2%) (Ministry of Health, Community Development, Gender, Elderly and Children 2016). Kilimanjaro region has low MMR (283), and two thirds of women (60.3%) accessed radio at least once a week, as compared to television (41.4%) and newspaper (17.4%). In addition, about three quarters of women (74.8%) owned mobile phones (33).

**Sampling**

The study included pregnant women aged 18 years or above. The percentage of women age 15–49 who receive antenatal care from a skilled provider for the most recent birth, according to background characteristics, Tanzania Demographic and Health Survey and Malaria Indicator Survey (DHS-MIS) 2015-16 for Pwani was 99.4%, while it was 98.3% for Kilimanjaro (33). There were no statistics of how many pregnant women attend ANCs in the selected districts per month. Indications are that most pregnant women attend ANCs for their antenatal care services in Tanzania. Therefore, the study only included pregnant women who are attending one of the selected ANCs. Only those who were less than 18 years old, and who suffered from an acute medical illness of a severity that rendered data collection activity impractical were excluded.

The Sample size was determined using Kish formula for cross-sectional studies (34). The sample sizes of pregnant women attending ANCs were calculated based on the percentage of pregnant women delivered in a health facility. According to the (33), about 86.4% of urban women delivered in a health facility of their most recent birth. Hence, the minimum sample size for pregnant women attending ANCs was 200, and about 260 (after adding 30 per cent for non-respondents).

**Data collection procedure**

Trained research assistants administered the questionnaires by using Geographical Information System (GIS) tablets to 260 study participants at the selected ANCs. We consulted the nurses at the ANCs to introduce the study and invite the study participants to participate in the study during the health education sessions that were normally provided before pregnant women entered a consultation room. The study did not want to interfere with the flow of patients in receiving medical care. Participants were recruited before or after antenatal appointment of pregnant women either in the consultation room or in the patient waiting rooms or in the patient waiting areas. The first two pregnant women were approached to participate in the study before or after receiving medical care at ANCs every working day of the clinic. The researchers introduced themselves and explained to respondents about the purpose of the research. Respondents were assured that the information they provided would be kept confidential. Once pregnant women agreed, they were required to sign consent forms after
which they were enrolled into the study. The researchers continued to recruit more pregnant women to participate in the study once the other enrolled participants had completed responding to the questionnaire survey.

**Research instrument**

The survey questions for the questionnaires were developed based on existing, tested and verified instruments (1). The first section of the questionnaire assessed the demographic characteristics (i.e. age, education, marital status, occupation, income per month) and obstetrics questions, such as on whether it was a first pregnancy or not, parity, gestational age, reasons for ANC visit, and awareness of HIV status. The second section of the questionnaire explored the health literacy using REALM-SF assessment Instrument (35). The last section of the survey assessed the health information seeking patterns of pregnant women. The questionnaire was translated form English to Kiswahili since most Tanzanians are comfortable to speak Kiswahili, the national language.

**Measures**

We measured the health literacy using the REALM-SF assessment Instrument (35). The REALM assessment tool has seven items. These items were contextualized to fit into the context of pregnant women information seeking behavior in the Tanzanian setting as shown in Appendix 1. We measured the seven items in the REALM tool using a seven-point Likert scale ranging from (0) to (7).

The study measured the information seeking patterns in two sets of questions. The first question, measured the frequency of using fifteen general information sources to obtain pregnant related information for the past three months, by using a five-point Likert scale, ranging from (1) Never to All the time (5). These sources included intentional (print books/brochures, print magazines/newspapers, and Internet), less intentional (TV/radio), and interpersonal (health professionals, family/friends, health fairs, and talks given by health organizations) sources (36). The second question measured the frequency of using six online information sources to obtain pregnant related information for the past three months by using a five-point Likert scale, ranging from (1) Never to All the time (5). These information sources included general websites, social media, online books, online journals, and online newspapers/magazines.

Finally, the study measured the outcomes associated with the information seeking process by using seventeen items. We measured this question by using a five-point Likert scale, ranging from (1) Strongly disagree to Strongly Agree (5).

**Data analysis**

We performed a chi-square test to examine whether there was any relationship between the health literacy and the following: demographic characteristics, general information sources, online information sources, and outcomes associated with information seeking process. We computed the average score of the seven items under health literacy variable. Afterwards, the study recorded the average score of the health literacy variable into two categories: low health literacy (Score 0–3 on REALM-SF) versus high health literacy (Score 4–7 on REALM-SF)

We assessed the relationship between health literacy and the use of general information sources and online information sources by using the Chi-square and Fisher exact test to compare the use of each information source between pregnant women with low and high health literacy. The same method was used to examine the association of health literacy with the outcomes associated with information seeking process.

We conducted Cramer's V test to determine the strength of the relationship between the health literacy and the following: demographic characteristics, general information sources, online information sources, and outcomes associated with information seeking process. According to (37), the magnitude of effect size of Cramer's V range from 0 (i.e. indicates that there is no relationship between the two variables) to 1 indicates a very strong relationship. We performed the analysis by using the Statistical Package for the Social Sciences, version 24. The statistical significance was p-value, 0.05.

**Results**
## Table 1
Pregnant women’s Demographic and Obstetric characteristics by Health Literacy level (N= 204)

| Variable                        | Health Literacy Level |          |          |          |          |          |          |          |          |          |          |
|---------------------------------|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                                 | Low literacy (£ 3 REALM score) | High literacy (> 3 REALM score) | N | Pearson X² | P-value | Cramer's V |
| Age category(yrs)               | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| <20                             | 2 (12.5)               | 26 (13.8)| 28       | 2.65     | 0.449    | 0.12     |
| 21 - 30                         | 8 (50)                 | 122 (64.9)| 130     |          |          |          |
| 31 - 40                         | 5 (31.2)               | 36 (19.2)| 41       |          |          |          |
| >41                             | 1 (6.3)                | 4 (2.1)  | 5        |          |          |          |
| Education level                 | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| No education                    | 4 (25)                 | 1 (0.5)  | 5        | 45.33    | <0.001   | 0.47     |
| Primary                         | 10 (62.5)              | 77 (40.9)| 87      |          |          |          |
| Secondary                       | 0 (0)                  | 90 (47.9)| 90      |          |          |          |
| College/Univ                    | 2 (12.5)               | 20 (10.7)| 22      |          |          |          |
| First pregnancy                 | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| No                              | 9 (56.3)               | 113 (60.1)| 122     | 0.09     | 0.763    | 0.21     |
| Yes                             | 7 (43.7)               | 75 (39.9)| 82      |          |          |          |
| Occupation                      | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| Housewife                       | 9 (56.3)               | 53 (28.2)| 62      | 5.61     | 0.060    | 0.17     |
| Employed                        | 2 (12.5)               | 29 (15.4)| 31      |          |          |          |
| Enterprenuer                    | 5 (31.2)               | 106 (56.4)| 111     |          |          |          |
| Gestation age (weeks)           | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| £ 20                            | 15 (93.7)              | 187 (99.4)| 202     | 4.97     | 0.026    | 0.16     |
| > 20                            | 1 (6.3)                | 1 (0.6)  | 2        |          |          |          |
| Number of Antenatal clinic visit| n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| £ 5                             | 13 (6.7)               | 180 (93.3)| 193     | 6.07     | 0.014    | 0.17     |
| >5                              | 3 (27.3)               | 8 (72.7) | 11      |          |          |          |
| Marital status                  | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| Married                         | 11 (68.8)              | 144 (76.6)| 155     | 0.64     | 0.725    | 0.06     |
| Single                          | 5 (31.2)               | 43 (22.9)| 48      |          |          |          |
| Divorced                        | 0 (0)                  | 1 (0.5)  | 1        |          |          |          |
| Household income (Tshs)         | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| No income                       | 8 (50)                 | 47 (25)  | 55       | 7.34     | 0.119    | 0.19     |
| 100,000                         | 7 (43.8)               | 74 (39.3)| 81      |          |          |          |
| 100,001 – 500,000               | 1 (6.2)                | 58 (30.9)| 59      |          |          |          |
| 500,001 – 1,000,000             | 0 (0)                  | 8 (4.3)  | 8        |          |          |          |
| 1,000,001 – 2,000,000           | 0 (0)                  | 1 (0.5)  | 1        |          |          |          |
| Number of Parity                | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| £ 3                             | 4 (25)                 | 115 (74.2)| 119     | 7.94     | 0.005    | 0.20     |
| >3                              | 12 (75)                | 73 (25.8)| 85      |          |          |          |
| Aware of HIV Status             | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
| No                              | 1 (6.3)                | 17 (9.1) | 18       | 0.15     | 0.701    | 0.02     |
| Yes                             | 15 (93.7)              | 171 (90.9)| 186     |          |          |          |
| HIV Status                      | n (%)                  | n (%)    |          |          |          |          |          |          |          |          |          |
Table 1 shows that among the demographic factors, level of education was statistically significant associated with the level of health literacy ($p < 0.001$). There was an increase in level of health literacy with the increase in the level of education. There was no observed statistical significance difference between age, marital status, monthly income, and occupation with the level of health literacy. However, the level of health literacy was better among married pregnant women than those who are not married, and among those who have high income than those with low income. Considering obstetric factors, the number of ANC visits, gestational age and number of parities were statistically significant associated with the level of health literacy ($p < 0.05$). The level of health literacy was higher among participants with: few numbers of parity, attended fewer ANC visits, and who had gestational age $\leq 20$ weeks versus those with $> 20$ weeks. The level of health literacy was higher among married pregnant women than those who are not married, and among those who have high income than those with low income. Considering obstetric factors, the number of ANC visits, gestational age and number of parities were statistically significant associated with the level of health literacy ($p < 0.05$). The level of health literacy was higher among married pregnant women than those who are not married, and among those who have high income than those with low income. However, the level of health literacy was not statistically significant.

In Table 2, a t-test was carried out to statistically examine the effect of level of health literacy on information seeking behavior. Seeking health information from village leaders was significantly associated with high level of health literacy ($p < 0.0001$).

In Table 3, a t-test was carried out to statistically examine the effect of level of health literacy on online information source. All online information sources were significantly associated with high level of health literacy ($p < 0.05$).
| Outcome | Health Literacy Level | N | Pearson X² | P-value | Cramer’s V |
|---------|-----------------------|---|------------|---------|------------|
|         | Low literacy £ 3     | High literacy > 3 |
| Educate others | n (%) | n (%) | N |          |           |
| Do not know | 1 (6.2) | 18 (9.6) | 19 | 1.7 | 0.79 | 0.09 |
| Strong disagree | 1 (6.2) | 5 (2.7) | 6 |          |           |
| Disagree | 3 (18.8) | 34 (18.1) | 37 |          |           |
| Agree | 11 (68.8) | 121 (64.3) | 132 |          |           |
| Strongly agree | 0 (0) | 10 (5.3) | 10 |          |           |
| Understand my health condition | n (%) | n (%) | N |          |           |
| Do not know | 0 (0) | 5 (2.7) | 5 | 4.8 | 0.19 | 0.15 |
| Strong disagree | 0 (0) | 0 (0) | 0 |          |           |
| Disagree | 0 (0) | 12 (6.4) | 12 |          |           |
| Agree | 16 (100) | 144 (76.6) | 160 |          |           |
| Strongly agree | 0 (0) | 27 (14.3) | 27 |          |           |
| Acquire knowledge | n (%) | n (%) | N |          |           |
| Do not know | 0 (0) | 7 (3.7) | 7 |          |           |
| Strong disagree | 0 (0) | 1 (0.5) | 1 |          |           |
| Disagree | 3 (18.8) | 11 (5.9) | 14 |          |           |
| Agree | 13 (81.2) | 150 (79.8) | 163 |          |           |
| Strongly agree | 0 (0) | 19 (10.1) | 19 |          |           |
| Understand information from HCW | n (%) | n (%) | N |          |           |
| Do not know | 0 (0) | 3 (1.6) | 3 | 0.9 | 0.92 | 0.07 |
| Strong disagree | 0 (0) | 2 (1.1) | 2 |          |           |
| Disagree | 1 (6.2) | 14 (7.4) | 15 |          |           |
| Agree | 14 (87.6) | 148 (78.7) | 162 |          |           |
| Strongly agree | 1 (6.2) | 21 (11.2) | 22 |          |           |
| Feel reassured | n (%) | n (%) | N |          |           |
| Do not know | 1 (6.2) | 3 (1.6) | 4 | 6.7 | 0.16 | 0.18 |
| Strong disagree | 1 (6.2) | 2 (1.1) | 3 |          |           |
| Disagree | 0 (0) | 10 (5.3) | 10 |          |           |
| Agree | 13 (81.4) | 136 (72.3) | 149 |          |           |
| Strongly agree | 1 (6.2) | 37 (19.7) | 38 |          |           |
| Confirm validity of health information | n (%) | n (%) | N |          |           |
| Do not know | 1 (6.2) | 9 (4.8) | 10 | 12.3 | 0.02 | 0.25 |
| Strong disagree | 1 (6.2) | 0 (0) | 1 |          |           |
| Disagree | 1 (6.2) | 17 (9.0) | 18 |          |           |
| Agree | 12 (75) | 140 (74.5) | 152 |          |           |
| Strongly agree | 1 (6.2) | 22 (11.7) | 23 |          |           |
| Reduce anxiety | n (%) | n (%) | N |          |           |
| Do not know | 1 (6.2) | 4 (2.1) | 5 | 1.2 | 0.76 | 0.08 |
| Strong disagree | 0 (0) | 0 (0) | 0 |          |           |
| Disagree | 1 (6.2) | 13 (6.9) | 14 |          |           |
| Agree | 12 (75) | 140 (74.5) | 152 |
|---|---|---|---|
| Strongly agree | 2 (12.6) | 31 (16.5) | 33 |

### Able to clear doubts

| Do not know | 1 (6.2) | 5 (2.7) | 6 | 5.6 | 0.21 | 0.17 |
| Strong disagree | 1 (50) | 1 (0.5) | 2 |
| Disagree | 1 (6.2) | 11 (5.8) | 12 |
| Agree | 11 (68.8) | 139 (74) | 150 |
| Strongly agree | 2 (12.6) | 32 (17) | 34 |

### To see a doctor

| Do not know | 0 (0) | 1 (0.5) | 1 | 4.8 | 0.32 | 0.15 |
| Strong disagree | 0 (0) | 1 (0.5) | 1 |
| Disagree | 1 (6.2) | 4 (2.1) | 5 |
| Agree | 8 (50) | 138 (73.4) | 146 |
| Strongly agree | 7 (43.8) | 44 (23.5) | 51 |

### Seek second opinion

| Do not know | 0 (0) | 4 (2.1) | 4 | 0.8 | 0.93 | 0.07 |
| Strong disagree | 0 (0) | 3 (1.6) | 3 |
| Disagree | 1 (6.2) | 8 (4.3) | 9 |
| Agree | 12 (75) | 144 (76.6) | 156 |
| Strongly agree | 3 (18.8) | 29 (15.4) | 32 |

### Share health information to others

| Do not know | 0 (0) | 1 (0.5) | 1 | 2.9 | 0.98 | 0.12 |
| Strong disagree | 0 (0) | 2 (1.1) | 2 |
| Disagree | 2 (12.5) | 16 (8.5) | 18 |
| Agree | 14 (87.5) | 144 (76.5) | 158 |
| Strongly agree | 0 (0) | 25 (13.4) | 25 |

### Recommend the health info to others

| Do not know | 0 (0) | 0 (0) | 0 | 17.0 | 0.000 | 0.29 |
| Strong disagree | 1 (6.2) | 1 (0.5) | 2 |
| Disagree | 1 (6.2) | 20 (10.6) | 21 |
| Agree | 12 (75) | 141 (75) | 153 |
| Strongly agree | 1 (6.2) | 25 (13.4) | 26 |

### Help others with health issues

| Do not know | 1 (6.2) | 1 (0.5) | 2 | 5.2 | 0.27 | 0.16 |
| Strong disagree | 0 (0) | 1 (0.5) | 1 |
| Disagree | 1 (6.2) | 18 (9.6) | 19 |
| Agree | 12 (75) | 141 (75) | 15 |
| Strongly agree | 2 (12.6) | 27 (14.4) | 29 |

### Ask questions during doctor's visits

| Do not know | 0 (0) | 1 (0.5) | 1 | 4.0 | 0.26 | 0.24 |
| Strong disagree | 0 (0) | 0 (0) | 0 |
| Disagree | 1 (6.2) | 6 (3.3) | 7 |
| Agree | 8 (50) | 133 (70.7) | 141 |
| Strongly agree | 7 (43.8) | 48 (25.5) | 55 |
Our findings showed a significant relationship between seeking health information from village leaders with high level of health literacy. Likewise, adults with adequate health literacy were more likely than those with inadequate or marginal health literacy to obtain health information from other sources; however, conversely to our findings, they were less likely to seek health information from alternative care providers (13). Furthermore, in alignment with our findings, having adequate level of health literacy has been reported to increase the scope of resources that would be mobilized whenever an individual need to seek health information and boost perception of efficacy for finding, comprehending, and using health information (18). These findings point to an important aspect of community-based health literacy, that has also been described by Kim and colleagues (18), implying, focusing on individual literacy does not address the capacity of the individual’s social network where health information would be sought. This calls for public health interventions targeting the general public ensuring overall high health literacy level communities.

### Table 4

| Improve my r/ship with my doctors | Do not know | Strong disagree | Disagree | Agree | Strongly agree | p | 0.96 | 0.06 |
|----------------------------------|-------------|-----------------|----------|-------|---------------|---|-------|-------|
|                                  | 0 (0)       | 3 (1.6)         | 3        | 0.6   | 0.96          | 0.06 |
| Strong disagree                  | 0 (0)       | 1 (0.5)         | 1        |       |               |       |
| Disagree                         | 1 (6.2)     | 11 (5.9)        | 12       |       |               |       |
| Agree                            | 11 (68.8)   | 137 (72.9)      | 148      |       |               |       |
| Strongly agree                   | 4 (25)      | 36 (19.1)       | 40       |       |               |       |

| Improve communication            | Do not know | Strong disagree | Disagree | Agree | Strongly agree | p | 0.80 | 0.07 |
|----------------------------------|-------------|-----------------|----------|-------|---------------|---|-------|-------|
|                                  | 0 (0)       | 3 (1.6)         | 3        | 1.0   | 0.80          | 0.07 |
| Strong disagree                  | 0 (0)       | 0 (0)           | 0        |       |               |       |
| Disagree                         | 1 (6.2)     | 15 (8)          | 16       |       |               |       |
| Agree                            | 13 (81.3)   | 132 (70.2)      | 145      |       |               |       |
| Strongly agree                   | 2 (12.5)    | 38 (20.2)       | 40       |       |               |       |

| Improve my nutritional status    | Do not know | Strong disagree | Disagree | Agree | Strongly agree | p | 0.3  | 0.97 | 0.04 |
|----------------------------------|-------------|-----------------|----------|-------|---------------|---|-------|-------|
|                                  | 0 (0)       | 1 (0.5)         | 1        |       |               | 0.3| 0.97  | 0.04 |
| Strong disagree                  | 0 (0)       | 0 (0)           | 0        |       |               |       |
| Disagree                         | 1 (6.2)     | 12 (6.4)        | 13       |       |               |       |
| Agree                            | 13 (81.3)   | 144 (76.6)      | 157      |       |               |       |
| Strongly agree                   | 2 (12.5)    | 31 (16.5)       | 33       |       |               |       |

Table 4 shows that pregnant women with high level of health literacy strongly agree to confirm (from health professionals) the validity of health information they receive from different health information sources. They also strongly agree to recommend the importance of searching health information to others. The observed relationship is statistically significant (p < 0.001).

### Discussion

This study investigated the relationship between health literacy and information seeking patterns and its associated outcomes among pregnant women in two districts of Tanzania. Among the demographic factors, the level of education was significantly associated with the level of health literacy where there was an increase in level of health literacy with the increase in the level of education. These results are supported by a study done among adults residing in rural and urban areas of Taiwan that shows health literacy was lower with lower education (13). In another study, a significant relationship was found between maternal health literacy and educational level among pregnant women (14, 15). Furthermore, among the obstetric factors, a significant association between ANC visits, gestational age and number of parities with the level of health literacy congruent to findings by Kharazi and colleagues (14). Similarly, women with low literacy are likely to have an unplanned pregnancy, less likely to have either discussed pregnancy ahead of time or taken folic acid (38) and with lesser knowledge and self-care behaviors (39) compared with women with adequate health literacy. This indicates that women with low literacy may not realize the risks associated with number of parity with pregnant-related complications. These findings underscore the importance of having women educated and the overall influence education has on maternal health behaviors. Reasons of high health literacy among participants who made fewer ANC visits could be that they are much aware of pregnant related issues and probably they have few risks/ pregnancy related complications an indication of having beneted from their better maternal health literacy. Equally, those with better health literacy on pregnant related matters are likely to attend to the clinic at earlier stages of pregnancy (14). Earlier ANC visits are very important for women get assured of their pregnancy status earlier on, because it is at lower gestational age many of screenings (including fetal screening) are done to determine the status of mother and the fetus. The level of health literacy was also high among participants who were aware of their HIV status compared to those unaware. It is certain that if one has high health literacy she is likely to explore a lot on HIV-related issues (in this context are those pregnancy-related) and later on take decision for determining their HIV status, this in turn can translate to revealing a more of negative tests among them. Similarly, evidence from previous studies suggest that maternal literacy status favorably influences vertical transmission of HIV (40) and low literacy being associated with lower HIV knowledge (41).

Our findings showed a significant relationship between seeking health information from village leaders with high level of health literacy. Likewise, adults with adequate health literacy were more likely than those with inadequate or marginal health literacy to obtain health information from other sources; however, conversely to our findings, they were less likely to seek health information from alternative care providers (13). Furthermore, in alignment with our findings, having adequate level of health literacy has been reported to increase the scope of resources that would be mobilized whenever an individual need to seek health information and boost perception of efficacy for finding, comprehending, and using health information (18). These findings point to an important aspect of community-based health literacy, that has also been described by Kim and colleagues (18), implying, focusing on individual literacy does not address the capacity of the individual’s social network where health information would be sought. This calls for public health interventions targeting the general public ensuring overall high health literacy level communities.
A significant association between level of health literacy with all online information sources was found in our study. Similarly, findings from a study among pregnant women in Norway that examine the role of web-based forums indicate the forums positively influence maternal health literacy in terms of increased health-related knowledge and competencies, increased awareness of health promotion and health protection, and increased system navigation (42). Surprisingly, in the same study, information provided online by other women was valued more than advice from HCPs. This is also supported by another study that revealed significantly more women reported internet and media sources than health professionals as the information source with the most impact on their health behavior (43). From a health care system perspective, these findings are alarming, calling for strategies to integrate online/ web-based information as part of health educational resources to ensure women have access to high quality health information resources.

Our findings indicated that pregnant women with high level of health literacy strongly agree to confirm (from HCPs) the validity of health information they receive from different health information sources and to recommend the importance of searching health information to others. In alignment with our findings, people with lower health literacy were less likely to trust information from HCPs but likely to trust information from social media, blogs, friends and pharmaceutical companies (20). Furthermore, low health literacy (and related skills) are reported to be negatively associated with ability to evaluate and trust online health information (22). This implies, people with low health literacy are likely to receive low quality health information that might negatively affect their health behavior. Enhancing pregnant women's and the general public's ability to evaluate information quality is of paramount importance to enable decision making on which information is of good quality for consumption.

Conclusions
This study examined the relationship between health literacy and information seeking patterns and its associated outcomes among pregnant women in two districts of Tanzania. The level of education was significantly associated with the level of health literacy where there was an increase in level of health literacy with the increase in educational level. Among the obstetric factors, a significant association was found between ANC visits, gestational age and number of parities with health literacy level. A significant relationship was found between health literacy with seeking health information from village leaders and all online information sources. Pregnant women with high level of health literacy strongly agree to confirm (from health professionals) the validity of health information they receive from different health information sources and to recommend the importance of searching health information to others. The findings underscore the influence education has on maternal health behaviors.

The study has several implications on practice. Health care providers need to have a continuous programme to assess pregnant women health literacy and information seeking process. Consequently, health providers will be able to provide health information that is relevant to pregnant women's health literacy levels during health education sessions, and other communication channels. Furthermore, there is a need for health interventions to target both individual women and the public that will help raise health literacy levels across communities. Lastly, the findings call for an integration of offline and online/ web based health information during ANC health educational sessions to ensure, pregnant women are facilitated to access and make decisions based on high quality health information resources. Health information dissemination should therefore combine health education sessions together with posters, leaflets, TV & radio programmes, newspapers, mobile text messages, and phone calls applications (or mobile health systems) to empower pregnant women to make informed decisions regarding their health.

Abbreviations
ANC: Antenatal care; DHS-MIS: Demographic and health survey and Malaria indicator survey; HCPs- Health care providers; GIS- Geographical Information System; MMR_- Maternal Mortality rate; USA- United states of America.

Declarations
Ethics approval and consent to participate
Ethical approval was sought and obtained from Muhimbili University of Health and Allied Sciences ethics review board. Furthermore, permissions to collect data were provided by the medical in-charges of the health facilities that were involved in this study. Written informed consent to participate in this study was obtained from individual participants. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication
Not applicable

Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests
The authors declare that they have no competing interest.
Funding

The Council for the Development of Social Science Research in Africa funded this study.

Authors' contributions

CM, RM, ETL conceptualized and designed the study, supervised data collection field activities. CM managed the writing and organization of the first draft of the manuscript. All authors revised and approved the final draft of the manuscript.

Acknowledgements

We wish to thank all the women who agreed to participate in this study. We acknowledge the contribution of the research assistants Mr. Emmanuel Massawe and Dr. Restituta Mushi for assisting with field activities.

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