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Original Article

Combining Health Calendars and Cash: Building Formal Financial and Health Numeracy Among Poor Women in Northern Pakistan: Baseline Survey Findings.

Salima Meherali[1], Brett Matthews[2], Kaleem Ullah[3], Zahra Ali Padhani[4], David Myhre[2], Waseem Abbas[3], Ashiq Faraz[3], Sadaqat Hussain[3] & Zohra Lassi[4,5]

[1]University of Alberta, College of Health Sciences, Faculty of Nursing, Canada.
[2]My Oral Village, Inc., Toronto, ON, Canada.
[3]Aga Khan Rural Support Programme, Skardu, Gilgit-Baltistan, Pakistan.
[4]Robinson Research Institute, Adelaide Medical School, University of Adelaide, Australia.
[5]School of Public Health, Faculty of Health and Medical Sciences, University of Adelaide, Australia.

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Corresponding Author Email: meherali@ualberta.ca

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Abstract

Background: The financial inclusion of women in Pakistan is very low compared to other low- and middle-income countries. Gender inequality is very prevalent in many rural areas of Pakistan such as the district of Kharmang in Gilgit-Baltistan and Chitral (GBC), one of Pakistan's five provinces.

Methodology: A cross-sectional survey was conducted among a random sample of 162 women from community-based savings group (CBSG) residing in Kharmang district of GBC. The study used the financial and health numeracy survey tool to test participants' financial and health numeracy skills. Descriptive analysis, bivariate analysis, chi-square and Pearson test were conducted to determine the differences between the proportions.

Results: Majority of the women were married and had very little or no business experience. The survey was comprised by women CBSG members with a mean age of 34 years. Numeracy and literacy capabilities broadly overlapped, revealing distinctly different profiles. Majority of women who had some primary education and spent 3-4 years in school feared/avoided written calculation and acquired few numeracy skills as a result. Only 10% of the women reported that they were completely responsible for decisions related to child health, while 49% reported they had a major say in such decisions. The study showed no correlation between educational attainment and decision-making power among women.

Conclusion: Financial and health numeracy skills contribute to women's empowerment and gender equality. It also contributes to an individual's attitude and behaviour towards uptake of healthcare services and to improve maternal and child health outcomes.

Keywords

Gender equality, women empowerment, financial numeracy, health numeracy, Northern Pakistan.

Introduction

There is increasing recognition that economically empowering women is essential both to realize women's rights and to achieve broader Sustainable Development Goals (SDGs), specifically #1 (no poverty), #2 (zero hunger), #3 (good health and wellbeing), #5 (gender equality) and #10, (reduced inequality). Research supports strong positive links between women's empowerment in the formal economy and foundational health outcomes for women and their families, including beneficial effects on nutrition, family planning, maternal mortality, and child mortality[1-3]. In addition, evidence also indicates that increasing the share of monetary household income controlled by women may produce other benefits, including greater investment in children's education, greater control by women over their reproductive health, delayed early marriages, decreased teenage pregnancies, and reductions in gender-based violence[2-5].

Financially literate individuals do better at budgeting, saving money, controlling spending, handling debts, participating in financial markets, planning for retirement, and accumulating wealth[6]. Moreover, financial status is directly related to better health, household wellbeing, and educational attainment by children and other family members[7-8]. Research evidence suggests that women's economic empowerment is a key factor for better health outcomes – specifically, better maternal and child health outcomes[9-10].

A widely neglected element of financial capability is 'financial numeracy', defined as "the numeracy skills required to carry out financial transactions with understanding, in real-time, without help from a third person"[11]. Financial numeracy is usually absent among the world's 773 million adults classified as illiterate, of whom 63% are women[12]. Lack of formal numeracy skills also impacts health numeracy. Health numeracy is the "degree to which individuals have the capacity to access, process, interpret, communicate, and act on numerical, quantitative, graphical, biostatistical, and probabilistic health information needed to make effective health decisions[13]. To sustain women's empowerment, it is important that their financial and health numeracy be targeted more directly.

Pakistan is home to approximately 220 million people.11 According to a 2020 World Bank report, the literacy rate in Pakistan was 58% in 2019; however, the rate was lower among females (44%) compared to males (69%) (Bank, 2020a) and is lower still among women and girls living in rural areas.12 Pakistan ranks poorly on the Gender Inequality Index and is 86th of 108 countries on the Social Institutions and Gender Index[13-14].

Over the past 15 years, attempts by both government and civil society organizations to improve the status of women have increased, although both sectors' efforts are constrained by insufficient fiscal resources. The government of Pakistan initiated its efforts for women's economic empowerment through the National Plan of Action in 1998 and encouraged the involvement of women in national development and the expansion of their roles, especially in economic activities. There are also numerous successful NGO-run rural support programs across Pakistan such as the Aga Khan Rural Support Programme (AKRSP)[15], which is the oldest and is a major non-profit organization established by the Aga Khan Foundation (AKF) working in Gilgit-Baltistan and Chitral (GBC) province (formerly known as 'the Northern Areas')[16]. AKRSP's overall goal is to improve the socio-economic conditions of the people of GBC through a variety of intervention strategies, including "institutional development, women's development, natural resource management, participatory infrastructure development and enterprise, and rural financial and enterprise development" [16]. However, poor financial and health numeracy skill levels are found among women in GBC A Labour Market Assessment (LMA) shows "that only 17% of women (and 41% of men) participate in paid labour, where some 50% of women are completely illiterate and homebound[17].

To improve the health and financial numeracy among women and young girls in GBC, the study authors initiated the "Calendars and Cash" (C&C) project in collaboration with the University of

Alberta, Faculty of Nursing (UOA), AKRSP, and My Oral village MOVE[17]. The C&C project aims to equip and empower illiterate, innumerate rural women and adolescent girls with formal numeracy and record-keeping skills through Oral information (OIM) solutions[17]. OIM solutions build on the abilities of illiterate/innumerate women to use banknotes and coins or images of them and other visual cues to safely and confidently handle the written elements of financial transactions such as purchases, sales, savings, loans, interest, even though they cannot read or write numbers. Before implementing the financial and health numeracy OIM tools a baseline survey was conducted to test women's financial and health numeracy skills. In this paper we are presenting the baseline survey findings.

Methodology

A cross-sectional baseline survey was conducted to test participants' skills such as reading numbers, dates, calculations, dosing instructions, and vaccination calendars. This tool was adapted to address the critical formal numeracy requirements that support both financial and family health empowerment. Android tablets were used for real-time data collection, enabling quality, remote management of field surveys, and supporting collaboration with other partners to complete high-quality data analysis.

Study Setting

The survey was conducted in Kharmang district, located in the Skardu division of Gilgit-Baltistan province situated in the northeast corner of Pakistan (Figure 1). Kharmang has a population is 0.05 million and covers 6,144 square kilometers covering one of the remotest valleys of the Skardu division of Gilgit-Baltistan (itself a remote territory) with limited access to healthcare facilities, education, and employment opportunities distinct features. India lies at the district's Southeastern border. Skardu district (regional headquarters) is situated in the Southwest and Northwest of Kharmang, while the Ghanche district of Baltistan is situated in the North and Northeast region of Kharmang. The Indus River enters Pakistan from India through Kharman and is the main water source for the agricultural plains in Sindh and Punjab provinces that are Pakistan's 'breadbasket'.

Figure 1: Map of Project Locations.

Community-based Saving Groups in Kharmang
CBSGs are one of several social institutions formed by AKRSP to improve social cohesion. They aim to address the longstanding and interlinked issues of poverty and inadequate health services in the remote and mountainous parts of Gilgit-Baltistan.

The C&C project works on building the financial and health numeracy capabilities of women in localities where illiterate women comprise the majority of each CBSG. The C&C project works with 21 CBSGs (previously built by AKRSP for the Sehath Manad Khandaan (SMK project) in the Kharmang district which have not been engaged before in any similar activity. There are 583 participants in these CBSGs. Table 1 shows the CBSGs locations spread over 21 villages in three Union Councils (UCs are the lowest tier of elected government) of Kharmang district. The CBSGs were formed and operating before the project's launch. The data shows that 23% (n=37) of the participants were based in Baghicha UC, 60% (n=98) were based in Mehdiabad UC, while the rest of the 17% (n=27) of the participants were based in Tolti UC.

Table 1. Project CBSGs in Kharmang District by Location, Membership Size, and Number of Baseline Survey Respondents.

Union Council	Village/CBSG Name	No. of Survey Respondents (n=162)
Baghicha	Aliabad Pari	11
	Gamba Pari	6
	Ghorkon Pari	7
	Goma Pari	6
	Goma Pari 2	7
Mehdiabad	Akhonpa Ghasing	8
	Chan Khor Mehdi Abad	7
	Essar Nishan Bagh	6
	Gadder Town	12
	Ghasing Bala	8
	Ghasing Paine	8
	Gong Yul	9
	Kaman Bagh	5
	Khar Mehdiabad	7
	Manthokha	6
	Monjong	8
	Panda Gamba	7
	Panda Goma	7
Tolti	Gahori	10
	Kamango Gons	8
	Kamango Youl	9

Sampling

A baseline survey was carried out with a representative sample of C&C participants. Careful attention was given to constructing the sample to ensure the validity and authenticity of the results so they can be used confidently for generalization. Probability sampling was used to identify the sample and 162 participants were randomly selected, then surveyed. For the details of the sample size calculation and the sampling strategy, please see Appendix 1 – Sampling Strategy.

Data Collection

To take stock of the baseline financial and health numeracy capabilities in Kharmang, the UOA, MOVE, and AKRSP's Baltistan regional team designed a baseline survey. It identifies and diagnoses the project participants' capabilities to read and write numbers and dates, make calculations, and use calendars to identify birthdates and vaccination appointments, among other numeracy domains (see Appendix 2 – Survey Probes). The survey tool was validated through pilot testing with 12 non-project participants and applied to a randomized sample of 162 participants. The survey was conducted from August to October 2022.

Data Analysis

We conducted an initial analysis by making frequency tables to identify possible errors in the data. After cleaning the data and running the possible quality checks we estimated descriptive statistics for the subjects and reported the data in ranges, percentages, and frequencies as appropriate.

For bivariate analysis, chi-square and Pearson correlation coefficient tests were conducted to determine the differences between the proportions. Eta value was recorded to analyse the effect of age on the ability to read small print because one of the variables was scale and the other was nominal, therefore Eta was used for measuring the association between these variables. All the analysis was conducted using IBM® SPSS® Statistics (version 26 [2019]).

Ethical considerations and safeguarding

The survey is approved by the University of Alberta ethics review board (Pro00119361). The University of Alberta's consent protocols were used during the survey. Participation in the research was completely voluntary.

Results

A total of 162 participants were surveyed at baseline. The age of participants ranged from 15 to 50 years (mean age 33.9 years; n= 151) and all respondents were active members of the CBSGs. Most of the study participants were married (82.1%), while 14.2% were single, 2.5% were widowed and 1.2% were divorced. About 41.3% (n=67) of the participants reported having children (<5 years) under their care.

In Kharmang Valley, Balti (a Tibetan dialect that evolved locally over time in Baltistan) and Shina (the language of the Dard people from the Indo-Aryan family of languages) are the most spoken languages of the region. Almost all participants spoke Balti at home while only one participant reported speaking Urdu (Pakistan's official language, which also is spoken in several regions of India and Nepal). Regarding education, a longstanding customary practice requires both men and women to join a madrassa (religious seminary) at a certain age. The survey found that more than half of participants attended madrassa only (55%; n=90) for at least one year, while 29% (n=47) reported completing memorizing the Holy Quran, an achievement typically requiring several years of study.

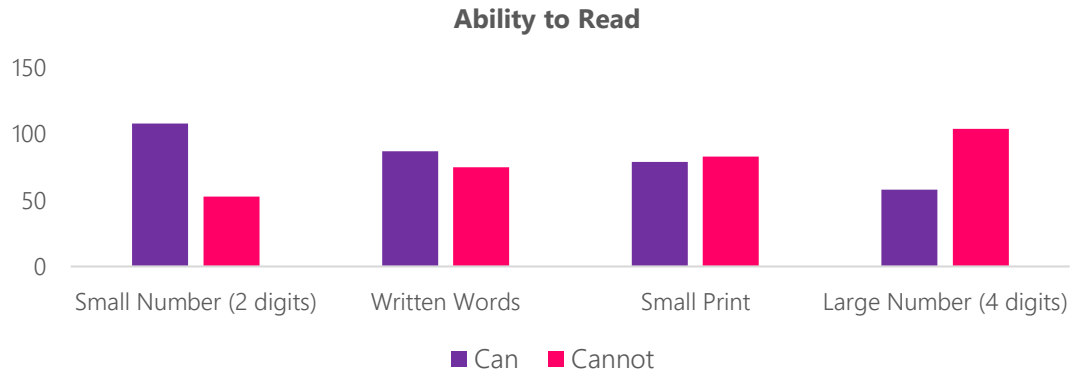

Figure 2: Ability to Read Words, Numbers, and Print.

Ability to read words, numbers, and small print

When questioned on financial experiences, 93% of the members reported having no business experience, 4% had worked in or owned some type of business, while 1% had sold some goods or animals by weight, and another 1% of the members had kept a record of purchases and sales. After the comprehension and capacity assessment, it was observed that the participants who were "illiterate" were unable to read words. However, this outcome reversed when the same test was applied to women who had completed their secondary/higher education (i.e., grade 10 or higher). The reading test was administered to a random sample of participants in each CBSG. Three probes were used to gauge if participants can "read text and numbers" within a simple sentence (i.e., "Today I bought a big bag of dried apricots for 2,450 rupees and salt for 30 rupees"). The sentence illuminates three capabilities: (1) to read words, (2) to read a two-digit number, and (3) to read a four-digit number. Additionally, participants were shown another sentence in small print to see if smaller print size adversely affected reading ability.

Figure 2 displays the three reading skills and the ability to read small print, with the strongest skills on the left and the weakest on the right. From the test it was observed that almost all the participants had the ability to read small numbers (67%; n=108), 54% (n=87) were able to read the written words in the test sentence, while only 36% (n=58) of the participants were able to read the large numbers. However, only one third (in total) of the participants were unable read words who may face great difficulties in carrying out their responsibilities specific to this skill set. The study showed a strong correlation between school attendance and the ability to demonstrate the skills. In spite of this, it is striking that even among those who are totally unschooled, over a third could read a 2-digit number, and even among those who could read the words, nearly a third could not read a 4-digit written number. This raises questions about AKRSP's strategy of relying on literacy as the principal qualifier for record-keeping.

The relationship between the reading abilities of the sample, and their levels of education is shown in Table 2. The Table 2 presents individuals' ability using the Pearson's r correlation technique to determine if any correlation exists between their ability to read words, long numbers, small numbers, and small prints. The top row displays the overall percentage of individuals' ability to perform these tasks. The Pearson's r value is provided for each of the different 'ability tests,' specifically their ability to read words, numbers, and so on. The two variables under consideration are: (1) Capability of reading; and (2) Education levels, derived from the total sample of N=162. The significance level of 0.01 (2-tailed) indicates the probability of observing a correlation, as found in this test, suggesting that there is no true correlation in the population between these two variables."

Table 2: Education vs Reading Ability.

N=162	Ability to Read by Schooling			
Schooled = N 88 **Unschooled = N 74**	**Words**	**2450**	**30 Rupees**	**Small print**
% Correct	54	36	67	49
Pearson's R	-0.67	-0.69	-0.55	-0.68
% of all schooled	85	64	92	81
% of all unschooled	16	4	36	12

Many unschooled adults have learned how to read 2-digit numbers, perhaps from some sort of participation in formal sector activities like markets or employment, or by accessing government services. In addition to showing the resourcefulness of this segment of the population, this also shows that in many cases they have been highly motivated to learn this skill, which suggests that others who have not learn it yet may also be motivated. There has been a considerable inter-generational improvement in access to schooling, so younger women were much more likely to have attended school.

Calendars and the importance of data checks cannot be overlooked. Thus, we also checked the ability of participants to point out the correct date on the calendar and it was observed that about 53% of the participants were able to point out the date on the calendar. Nearly, 30% of the participants refused to answer it, underscoring the importance of date awareness and the vulnerability associated with innumeracy.

Financial Capabilities

Despite poor unpaved road and cellular network issues, 65% of the participants reported owning a mobile phone.

Counting

Counting money is very important as the women members encounter instances involving record keeping, counting and savings as part of their daily routines, especially in the CBSGs. To assess the level of understanding of CBSG members related to counting money, a simple test was designed where cash amounting to PKR 830 in different denominations were provided to them, and they were asked to count the cash.

The survey showed that about 66% of the participants were able to correctly count the banknotes and coins, the rest of the participants failed to do so or declined to answer. The counting strategy is also a very important measure of women's recognition of the sum given to them for counting. About 43% of the women held notes in their one hand counted from the other hand, 17% of women spread the notes/coins (in different order) on a flat surface for visibility, while the other women did not either organise/plan before counting the notes or the coins. Later, women were asked to recognize the counted amount (i.e., 830) on a sheet with five different numbers and only 48% of the women were able to identify the counted number correctly.

Mental calculation

CBSG operations involve frequent calculations as the members buy shares (i.e., make deposits), receive and repay funds. The ability to perform several mental calculations is presented in Figure 3, with the strongest skills on left and the weakest on the right. The strength of the skills on the left reflects the fact that women in the villages use traditional means to make fractions and volume calculations. Eighty-three percent (n=133) of the women correctly answered the fraction question while 67% (n=109) were able to correctly answer the volume calculation.

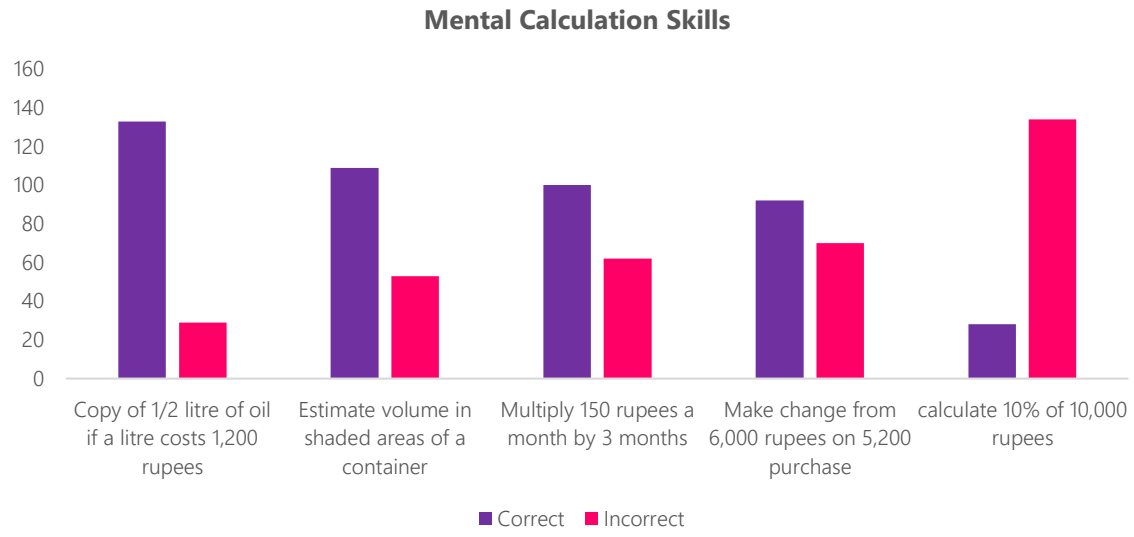

Figure 3: Ability to Perform Mental Calculations.

Handling questions on large sums and percentages was assessed among CBSGs and the results showed that about 57% (n=100) of the participants were able to correctly answer the questions on large sums, while 33% (n=53) incorrectly answered the question, and the remaining 10% declined to try. For percentages, women were assessed to see if they could make "share-out calculations" or not (involving percentages) and only 17% (n=29) of the women were able to correctly answer this question. The rest either declined to answer or answered this question incorrectly. 'Percent' is an arithmetic concept that appears to be rarely learn outside of school, although it rests at the heart of finance.

Participation in household financial decision making

Women were questioned on their contribution to household decision-making and it was observed that household decision-making power was the highest among the women aged 25-36 years-old followed by 37-48 years-old, then those 49 and older. This reflects the higher relative schooling levels of the younger group. However, there was no association between education and decision-making power among women. This suggests that older women may be able to make up for limited schooling through increased experience, and the skills resulting from it.

Health Numeracy

Dates are a very important indicator of women's ability to track and record their health calendar. In villages, there are traditional ways to remember the age of individuals. To remember age, they use loskors, a Balti word for tracking age (1loskor=12 years). However, this practice is now being jettisoned and the modern Georgian calendar year is used as a reference.

When questioned on their date of birth, only 19% of the respondents were able to correctly state the date, month, and year of their birth. Women aged 25-36 years and 19-24 years, were mostly able to report their date of birth correctly.

Vaccination

The respondents were provided a vaccination card and it was used to gauge their understanding related to vaccination. When questioned on vaccination record location (i.e., child's last vaccine record), 32% of the participants correctly identified it, 26% were incorrect, and 42% did not answer the question. Date of last vaccination was correctly

answered by 24% while date of future vaccination was correctly answered by 22% while the rest of the respondents were either incorrect or were unable to answer the question.

Pregnancy and child health measurement

Ninety-one women who participated in the survey were pregnant. These women were questioned related to their pregnancy and 60% of the women were able to correctly answer the questions. Date of birth and height (in cm) of the youngest child was answered correctly by 30% and 4% of the eligible respondents, respectively. Thirty-five percent of the women answered their weight or the weight of their youngest child correctly.

Decision making about child's health is another important aspect. About, 10% of the women reported to fully make decisions related to their child's health while 49% reported having a major say in decisions.

Discussion

The baseline survey included 162 CBSGs women members from Kharmang Valley of Baltistan District. Most of the CBSGs members were married, spoke Balti language, and had not attended school. Only 12% of the CBSGs member had graduate degree and 11% had completed their secondary education. Almost all the members were involved in farming and household chores and had very little or no experience in business or finances. Only 1% of the women were involved in business which involved selling goods or animals, while the other 1% of the women kept a record of purchases and sales. The key findings of the study are summarised in Table 3.

Table 3: Diagnostic Results and Project Goals.

	Use Cases	Skills Required	Skill Gap (Based on Diagnostic Survey)
Users of CBSG Records	Track personal savings and personal loan repayments Identify errors in personal records	1-digit fluency Read number frames Tabular format	15% + can't write 1-digit 33% can't read 2-digits 76% can't read numeric dates
Keepers of CBSG Records	Keep CBSG records accurately and completely Collaborate with members to correct errors and omissions Prepare other members to keep records	2-digit fluency Number frame fluency Arithmetic operators and phone calculator Percent (for share-outs)	33% can't read 2-digits 52% can't read 3-digits 64% can't read 4-digits 70% can't use calculator 76% can't read numeric dates 83% don't know 'percent'
Pregnant Women	Tracking dates of vaccinations, check-ups and delivery Tracking high-risk symptoms Nutritional needs and supplements	Numeric dates Volume and weight measurements Iconography	76% can't read numeric dates
Women with Infants	Tracking dates of vaccinations and immunization status Identifying health risks requiring clinic visits Nutritional needs and supplements, mother and child	Numeric dates Volume and weight measurements Iconography	76% can't read numeric dates

Age and education are the most important determinant of health literacy[18]. Through this survey, it was observed that women who were illiterate were unable to read words but could often read 2-digit numbers. This correlation demonstrates that many unschooled participants who were able to read 2-digit numbers might have learned these skills during their participation in social and formal activities usually taken place at markets or at employment. Surprisingly few women, even among those who had attended school, could read large numbers. The study also showed a strong correlation between school attendance and the ability to demonstrate the skills and a poor correlation between age and the ability to read small print. It was also observed that there has been a considerable inter-generational improvement in access to schooling, as it was seen in the survey that younger women were much more likely to have attended school compared to women of greater age.

Prose literacy is generally found to be more difficult to achieve than numeracy[19]. This may be the reason most of the women in the survey were able to correctly answer large sums and were able to answer the questions on fractions, volume, and percentages. These women were also able to correctly count the bank notes and coins, but these women were unable to track down the same amount when written down on a paper. The health numeracy test showed that CBSG women were barely able to track the date on a vaccination card, and very few women were able to tell the date of birth, weight and height (in cm) of their youngest child correctly. The survey also showed that women who were literate were able to give answers more correctly compared to the other women. It is plausible that the skill, knowledge or education gained at higher levels equips an individual with a greater ability to interpret and grasp information adequately[20-23].

The literacy skills in the CBSGs In Kharmang District varied widely depending on their area of residence. The literacy levels predominated among women who belonged to Mehdi Abada Union Council (UC) of Kharmang district as these women had an opportunity to attend school for a longer duration of time and had greater access to formal sector systems. Despite being slightly educated and skilful, not all CBSG women had the opportunity to contribute to household decision making. The women also did not have a say in issues related to child health. Household decision-making power was found highest among the women aged 25-36 years-old followed by 37 years old and older women. However, no association was found between education and decision-making power among women. Studies also suggest an unclear cohabitation between education and women empowerment[24-26], but they do suggest a strong association between women empowerment and child growth and cognitive development[23-26]. The lack of correlation between educational attainment and decision making likely reflects on the traditional roles of women and the patriarchal tradition that dominates. There also exists the possibility that since women typically are not the main income earners, their contribution to household financial decision making is relatively low. Limited access to formal schooling, financial institutions, socio-cultural barriers, lack of awareness of gender-based discrimination, and limited financial literacy have limited rural women's socio-economic development[27].

The survey highlighted that many CBSG were able to write 1-digit numbers which emphasises on the basic education and training on learning how to use calculators on a mobile phone and understanding percentages. It also clearly showed that many adult women have been picking up skills in the household or in the markets even if they have had limited access to schooling. This suggests that, there are opportunities to build a learning program that capitalizes on the cognitive resources found at all levels of schooling and experience in the CBSGs[28-29]. These observations illustrate the complexity of the binary concept of literate vs. illiterate, since in practice different people sustain a different mix of literacy skills that are associated with, but by no means determined by, their levels of schooling. Even 'illiterate' members have the capacity to teach, and even 'literate' members have the capacity to learn. It also indicates a strong

motivation to learn, and suggests that even in this remote area, opportunities to learn these skills (such as in markets, business or employment, or through the use of phones) exist. The findings also demonstrate that almost all CBSGs have the ability to read and write long numbers, since they are composed on average, of about 20 members each, so it is probable that at least one member possesses this skill.

Based on the finding of the baseline survey, the authors of the study plan to take this project to another level where the authors will train women until they have the ability to consolidate their gains so they can engage confidently with formal financial and health systems where written amounts and dates are the norms.

Strengths and Limitations

The survey has some strengths and limitations. The limitation of the survey is that it includes a risk of recall bias. The sample is very small so the findings cannot be generalised. The strength of the survey is that it is the first survey to our knowledge that has directly tested the financial and health numeracy capabilities of women in GBC. Secondly, the sample was randomly collected to reduce the chances of selection bias.

Conclusion

Financial and health numeracy contribute to sexual and reproductive knowledge. It may also contribute to an individual's attitude and behaviour towards uptake of healthcare services and to improve maternal and child health outcomes. There are ways to capitalize on the complex and multivariant dimensions of literacy and numeracy found in poor communities that can ease the process of building vital financial, numeracy and record-keeping skills. Further research should be conducted to explore the association between health and financial numeracy and women empowerment and reproductive health knowledge and outcomes.

Data Availability

Research data will be kept in the Health Research Data Repository (HRDR) at the Faculty of Nursing, University of Alberta; a secure and confidential virtual research environment used to store data through its life cycle. Data will be available on request.

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