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Does participation in self-help group-based micro-financial activities enhance the financial literacy of women? Evidence from India

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Abstract

Purpose – The present study analyses the impact of participation in the self-help group (SHG)-based micro-financial activities (PSMFA) on the financial literacy (FL) of women.

Design/methodology/approach – The data were collected from Kudumbashree NHG members from the State of Kerala, India, selected through a multi-stage random sampling method. The relationship is examined by employing multiple linear regression (MLR) and artificial neural network (ANN) analyses.

Findings – The PSMFA was found to be improving the FL level of SHG members. Participation in FL promotion programmes of the SHGs did not significantly influence the FL of the SHG members. While higher educational levels and increased family income positively influenced the FL of SHG members, factors such as age, occupation, family type and marital status did not exhibit a significant impact.

Originality/value – To the best of our knowledge, the present study is the first to analyse the impact of PSMFA on the FL of the SHG members.

Keywords Analytic hierarchy process, Artificial neural network, Financial education, Financial literacy, Microfinance, Self-help group

Paper type Research paper

1. Introduction

The empowerment of women is crucial for achieving sustainable development goals (SDGs), as women play a pivotal role in the growth and development process of the economy (Mahato *et al.*, 2023). It enables women to be socially and economically independent by allowing them to participate in decision-making, express opinions, and achieve financial stability (Banerjee *et al.*, 2020). The empowerment makes the women realise their true potential and ensures their increased participation in the labour market and productivity, which not only results in their own well-being but also the national well-being (Banerjee *et al.*, 2023). Despite continuous efforts by governments, significant gender inequality persists in many nations, and achieving Sustainable Development Goal 5 (SDG 5) on gender equality remains a distant challenge.

The self-help group (SHG) approach is considered one of the most popular group-based women empowerment initiatives, especially in South Asia (Brody *et al.*, 2016; Kumar *et al.*, 2021). SHGs are "membership-based organisations/community-based organisations", facilitated by NGOs, the government, and sometimes the private sector, where members work together toward individual objectives by accessing various micro-financial services and collective goals through community actions (Kumar *et al.*, 2019). Previous literature has found that participation in SHG activities has empowered women in various in terms of dimensions, including economic (Raghunathan *et al.*, 2023), political (Kumar *et al.*, 2019), social (Kumar *et al.*, 2019), and psychological empowerment (Mahato and Jha, 2024). Further, the SHG Bank

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Linkage Programme has the potential to promote social sustainability and achieve various SDGs such as SDG 1 (no poverty), SDG 2 (zero hunger), SDG 5 (gender equality), SDG 8 (decent work and economic growth) and SDG 10 (reduced inequality) (Al-Kubati and Selvaratnam, 2023).

Participation in the SHG-based micro-financial activities (PSMFA) has led to the economic empowerment of women through promoting financial inclusion. By providing access to finance, SHGs enable women to perform various money-related activities and experience money-handling situations, which are new to many since they have never done it before or were not allowed to do it before (Brody *et al.*, 2015). Through providing opportunities to participate in various micro-financial activities, SHG enhanced its members' capacity for increased credit absorption, opening and operating bank accounts (Mathur and Agarwal, 2017), generating income, timely repayment and control of loans (Paramanandam and Packirisamy, 2015). Various studies, for example (Maity, 2023), noted that active engagement in SHG-based micro-financial activities has accelerated the penetration of financial inclusion. While numerous studies have explored the impact of PSMFA on members' financial inclusion, there appears to be a gap in the literature regarding its influence on Financial Literacy (FL).

FL is considered a demand-side instrument helping individuals acquire the proficiency to demand essential financial products and services, make careful financial decisions, and nurture awareness regarding diverse financial scams and malpractices; on the other hand, financial inclusion functions as a supply-side instrument, facilitating access to requisite financial products and services (Khan *et al.*, 2022). Therefore, achieving equitable FL along with financial inclusion is necessary for the economic development of a nation as both are complementary to each other. However, various national and international studies continuously indicate that women from diverse geographic, demographic, and socio-economic origins have lesser FL than their male counterparts (Goyal and Kumar, 2021; Kadoya and Khan, 2020; OECD, 2020, 2023; Potrich *et al.*, 2015; Santini *et al.*, 2019). The gender gap in FL is also noticeable in India, where only 21% of women are financially literate, compared to 29% of men (NCFE, 2019). Given women's pivotal role in driving economic growth (Mahato *et al.*, 2023), enhancing their FL is crucial for empowering them to achieve SDGs and contribute to national development. Therefore, effectively utilising women empowerment mechanisms like SHGs is essential to boost women's FL. As governments, policymakers, and other stakeholders actively explore effective ways to enhance FL, if PSMFA is proven to improve FL, SHG can be widely utilised as a robust initiative to deliver financial education. SHGs could then serve as a primary vehicle for empowering women through financial education and financial inclusion. Moreover, the SHG could also be leveraged to empower other marginalised sections of society. However, existing literature lacks insights into how PSMFA influences FL.

SHG operations centre on weekly meetings where members engage in various micro-financial activities like pooling of savings, loan distribution, discussing new loans, and other financial matters. These meetings promote collective learning, allowing members to share insights on personal finance, entrepreneurship, and life skills. Trust and community among members facilitate open discussions and unbiased advice. This environment supports collective learning, especially in personal finance, which is the core focus of SHGs. SHG meetings offer opportunities to learn about financial products, detect scams, and seek advice, enhancing members' financial decision-making and promoting responsible behaviour. Hence, it can be assumed that participation in various SHG-based activities, especially micro-financial ones, may eventually lead to improved FL among its members. Further, the social constructivism theory supports this assumption as it assumes an individual's frequent social and cultural interaction constructs knowledge and understanding about various domains (Amineh and Asl, 2015). Even while the SHG holds the potential to enhance the FL of women and consequently integrate them into the formal financial system, no study examined how participation in SHGs influences the FL levels of its members. Hence, this study aims to fill

this gap in the existing literature by examining the case of Kudumbashree NHG from the State of Kerala, a highly successful state-based SHG initiative in India.

The rest of the paper is organised as follows: Section 2 presents the review of literature and hypothesis development. Section 3 shows the methodology. Section 4 presents the results and discussion. Finally, Section 5 concludes the study by highlighting the implications and scope for future research.

2. Review of literature and hypothesis development

2.1 Financial literacy

The OECD defined FL "as a combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial well-being" (Atkinson and Messy, 2012). FL, an essential life skill that helps individuals adapt to an ever-changing environment and improve their well-being, is one of the most explored research areas in the past decade (Philippas and Avdoulas, 2020). FL gives more insight and builds confidence to make the right financial decisions, which, in turn, will result in both good financial and subsequent overall well-being in life (Kakinuma, 2022). FL also makes a significant positive change in the financial inclusion process and makes it meaningful (Grohmann *et al.*, 2018). Despite numerous efforts, providing adequate FL for citizens is still one of the major challenges for all nations, especially developing nations. A recent OECD (2023) FL survey on adults reveals that the adult population in all 39 participating countries have an average FL score of 60 out of 100 points. Further, it is reported that only 34% of the adults in participating countries had scored the minimum target FL score of 70.

2.2 Financial literacy and PSMFA

The relationship between FL and PSMFA is grounded in social learning theories, particularly social constructivism. Social constructivism is a social learning theory proposed by Russian psychologist Lev Vygotsky, which emphasises that learning does not occur within the individual but is created through interactions and collaborations with their environment (Davis *et al.*, 2017; Schreiber and Valle, 2013). This theory assumes that individuals construct knowledge, significance and meaning through social and cultural interaction, interpretation and understanding (Amineh and Asl, 2015). The core construct of social constructivism is the zone of proximal development (ZPD), which describes various activities that an individual can perform with the support of those who are more capable of doing the same (Davis *et al.*, 2017). It suggests that individuals can effectively master various knowledge and skills and go beyond their current level through interaction and collaboration with more knowledgeable others (Davis *et al.*, 2017; Schreiber and Valle, 2013). This theory emphasises the importance of participation in community-based organisations for acquiring knowledge and skills. These organisations foster social interactions and collaborations, enabling collective learning in shared areas of interest.

Money-related social meanings and realities are not totally derived from objective and unbiased observations of the outside world (Danes *et al.*, 2016). Instead, it is based on how people have experienced life in the contexts of their families, communities, and educational environment (Danes *et al.*, 2016). Active involvement in social interactions and collaborations may construct knowledge and understanding of the complex financial world and enhance the ability and skill required to make effective financial choices. Hence, people who are actively participating in community-based organisations that are primarily formed for the economic empowerment of their members, such as SHGs, have the potential to have better FL than those who are not participating. Brody *et al.* (2015) found that participation in SHG activities helps members attain better money-handling skills and confidence in financial decision-making. Similarly, participation in SHG-based micro-financial activities makes the members familiar with managing money and provides financial independence (Brody *et al.*, 2016; Pandhare *et al.*, 2024). Engagement in SHG activities,

particularly micro-financial ones, can enhance FL among members by involving them in financial decision-making, increasing their understanding of financial products and services, and raising awareness of financial frauds and malpractices. Therefore, PSMFA can potentially shape the members' construction of social meanings and realities about money. Along with PSMFA, the regular and periodic meetings among the SHG members, the constructive discussion and fearless exchange of views on money-related issues at meetings, and the suggestions and advice gained over there are bound to have a beneficial and desirable effect on the members' FL. Thus, the relationship between PSMFA and FL is hypothesised as follows:

H1. PSMFA improves the FL level of the SHG members.

2.3 Financial literacy and participation in SHG-based FL promotion programmes

FL promotion programme is widely considered an effective tool for providing the foundation for improving FL and thereby fostering financial well-being. However, the effectiveness of financial education through such programmes is largely debated because many empirical studies found muted effects (Kaiser *et al.*, 2022). Thus, nations, particularly emerging economies, seek better vehicles for effectively imparting financial education among marginalised groups. Since community groups can be effectively utilised to offer FL enhancement programmes to large and diverse segments of the population (Lusardi, 2019), the SHGs also have the potential to deliver the same to their members. As the Kudumbashree NHG also conducts FL promotion programmes for its members, the present study also sought to address how participation in SHG-based FL promotion programmes influences the FL level of its members by testing the following hypothesis:

H2. Participation in SHG-based FL promotion programmes positively influences the FL level of SHG members.

2.4 Financial literacy and demographic and socio-economic characteristics

Previous studies reported that demographic and socio-economic characteristics such as gender, age, marital status, education, income, etc., shape individuals' FL levels (Garg and Singh, 2018). Hence, the FL level of SHG members might have been characterised by their demographic and socio-economic background. As little is known about the impact of demographic and socio-economic characteristics on FL of the SHG members, the present study examined the same by using most potential demographic and socio-economic factors such as age, education, occupation, marital status and family income identified from the review conducted by Goyal and Kumar (2021) and Saharan *et al.* (2023). The relationship has been hypothesised as follows:

H3. Demographic and socio-economic characteristics significantly impact the FL levels of SHG members.

3. Methodology

3.1 Data and sample

As Kudumbashree NHG stands out as one of the five prominent state-based SHG initiatives in India (NABARD, 2021), and Asia's largest women's community network (Parvathy and Kumar, 2022), the Kudumbashree NHG members were selected as the target group of the study. The Kudumbashree NHG is the primary level unit of the Government of Kerala's poverty eradication and women empowerment programme called "Kudumbashree [1]". The programme was introduced by the State Poverty Eradication Mission (SPEM) of the Government of Kerala in 1997. The literal meaning of "Kudumbashree" in the Malayalam language is "prosperity of the family". Commonly, "Kudumbashree" refers to two entities, namely the Kudumbashree Mission and the Kudumbashree Community Network. These two

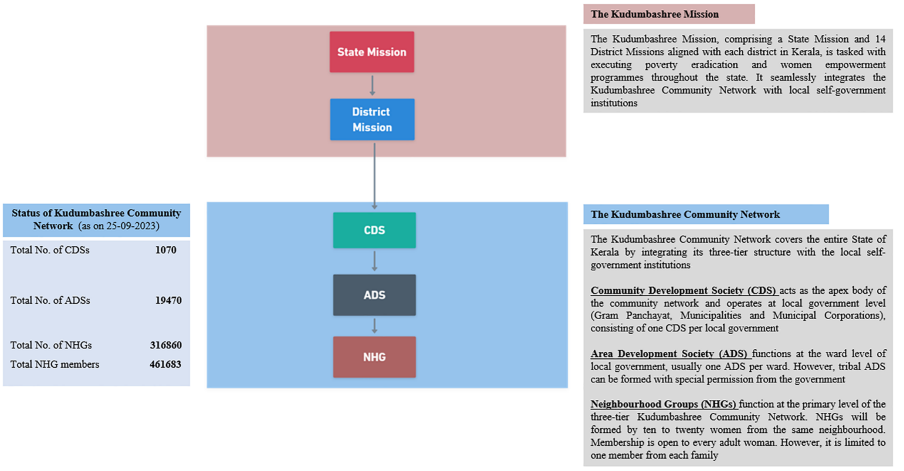
entities facilitate the programme "Kudumbahsree" (see Figure 1). Figure 1 presents the structure of Kudumbashree and the status of the Kudumbashree Community Network.

The required number of sample units was calculated using G*Power, a widely used power analysis software across various disciplines that determines the sample size required for different analyses. By specifying an expected effect size of 0.15 at a 5% significance level, the minimum sample size required for performing Multiple Linear Regression (MLR) analysis to achieve 90% statistical power for a model consisting of eight independent variables was 136 (Meneau and Moorthy, 2022). Further, the rule of thumb suggested by Hair *et al.* (2017) states that 15 to 20 observations for each independent variable are required for carrying out MLR. Accordingly, the present study required a sample size of 160 (20 observations for each independent variable). The researchers decided to collect data from 200 sample units as it exceeds both the required level of sample size by power analysis and the recommendation by Hair *et al.* (2017).

We employed a multi-stage random sampling technique to select appropriate sample units and used the interview schedule to collect the data. We used Kudumbashree Community Network-based statistics from the State Mission, District Mission, CDS, and ADS to develop a sampling design. In the initial stage, Kozhikode district was chosen based on criteria such as having the highest number of active NHGs and average NHGs per ADS. In the second stage, Panangad CDS was selected for having the highest number of ADS with the high average ADS grading (rating of ADS based on its performance). Subsequently, in the third stage, five ADS within Panangad CDS were chosen due to having the highest number of active NHG members. Finally, a total of 200 sample units were selected proportionate to the NHG members in each of the five chosen ADS: Ezhukandy (37 out of 324 members), Karayathodi (40 out of 361 members), Kattampally (41 out of 370 members), Nirmalloor (44 out of 394 members), and Panangad (38 out of 341 members).

3.2 Measurement of financial literacy

Researchers have provided various definitions of FL based on the context of their studies and measurement contents. Further, the operationalisation of FL often differs from its conceptual definitions. To ensure consistency in both conceptualisation and operationalisation and to produce globally comparable results, we have adopted the OECD's FL definition and



Source(s): Authors' own work (using the data available at http://www.kudumbashree.org)

Figure 1. Structure of Kudumbashree and status of Kudumbashree Community Network

measurement toolkit, which is gaining widespread popularity among researchers, particularly in India (Arjun and Subramanian, 2024). We measured FL by adopting the "OECD Toolkit for measuring FL" (OECD, 2018). However, a few minor modifications have been made to the measurement items in terms of currency and financial products/services. The OECD Toolkit assesses FL using a multidimensional composite index that consists of 18 items [2]: seven from the "financial knowledge" dimension, eight from the "financial behaviour" dimension, and three from the "financial attitude" dimension. The FL score was calculated by combining scores of all three dimensions: financial knowledge (score ranging from 0 to 7), financial behaviour (score ranging from 0 to 9), and financial attitude (score ranging from 1 to 5). Hence, the minimum FL score is one, and the maximum score is 21.

3.3 Measurement of PSMFA

A composite index is formed by aggregating or combining indicators representing different dimensions of a phenomenon (Mazziotta and Pareto, 2016). It can be created by giving equal or unequal weights to indicators or criteria based on relative importance. The present study created a composite index for PSMFA using the Analytic Hierarchy Process (AHP) weighting approach. Through the AHP approach, the experts in the field were asked to make pairwise comparisons of criteria and assign relative importance to each criterion (Greco *et al.*, 2019). After that, the weight was given to each criterion based on their relative importance.

By using the AHP approach, experts associated with Kudumbahsree NHG, such as assistant district mission co-ordinator, chairpersons and vice-chairpersons of CDS and ADS and presidents and secretaries of NHGs, were asked to note down the basic micro-financial activities offered under Kudumbashree NHGs. Subsequently, they were asked to rank the noted micro-financial activities based on the relative importance of each activity. All the experts noted that weekly thrift savings schemes, internal credit facilities, and bank linkage loans are the basic micro financial services provided by Kudumbahsree NHG. So, the authors considered these three micro-financial services as indicators for computing the PSFMA composite index. Based on average rank, thrift savings schemes ranked as the top important indicator, followed by internal credit facilities and bank linkage loans. Thrift savings schemes have been consistently ranked as the top indicator by the experts, and this may be because the primary function of Kudumbashree NHGs is to encourage savings habits among their members. Based on the relative importance and ranking given by the experts, the indicator' thrift savings' was given higher points, and the remaining two indicators, "internal credit" and "bank linkage loan", were treated equally. Two points were given for thrift savings if the members made three or four contributions to thrift savings per month, one point for one or two contributions, and 0 points for no contribution. However, in the case of internal credit, one point was given if the members used internal credit at least once after joining the SHG, and 0 points if they did not. Similarly, 1 point was given if the members utilised the bank linkage loan at least once after joining the SHG, and 0 points if they did not. The composite index score from these three indicators yields a minimum of 0 and a maximum of 4 for PSMFA.

3.4 Empirical analysis

3.4.1 Multiple Linear Regression (MLR) analysis. We analysed the determinants of FL by using MLR. We have used the Ordinary Least Square (OLS) method to perform MLR. For testing the regression model, we took the FL score (fl_i) as the dependent variable and age (ag_i), educational qualification (edu_i), occupation ($occu_i$), family income (fm_i), participation in SHG-based micro-financial activities ($psmfa_i$), family type (ft_i), marital status (ms_i) and participation in SHG-based FL promotion programmes ($psflp_i$) as independent variables. Independent variables such as educational qualification, occupation, family income, family type, marital status, and participation in SHG-based FL promotion programmes are categorical. We used dummy variables for each of the categorical independent variables. The regression equation is as follows;

$$fl_i = \alpha_0 + \beta_1 ag_i + \beta_2 edu_i + \beta_3 occu_i + \beta_4 fm_i + \beta_5 ft_i + \beta_6 ms_i + \beta_7 psmfa_i + \beta_8 psflp_i + \varepsilon_i$$

where, fl_i = financial literacy score of the respondent

ag_i = age in years

edu_i = if the education qualification of the respondent is higher secondary education and above = 1, otherwise = 0 (Ref. category: Below higher secondary education)

$occu_i$ = if the respondent is working = 1, otherwise = 0 (Ref. category: Not working)

fm_i = if the annual family income of the respondent is more than Rs. 25,000 = 1, otherwise = 0 (Ref. category: Below Rs. 25,000)

ft_i = if the respondent is living in a nuclear family = 1, otherwise = 0 (Ref. category: Joint family)

ms_i = if the respondent is married = 1, otherwise = 0 (Ref. category: Unmarried or Widowed)

$psmfa_i$ = score for micro-financial activities

$psflp_i$ = if the respondent participated in the SHG-based FL promotion programmes = 1, otherwise = 0 (Ref. category: Not participated)

3.4.2 Artificial Neural Network (ANN) analysis. It was noted from the literature review that the independent variable "age" has a non-linear relationship with FL. As the proposed statistical analysis "MLR" cannot detect non-linear relationships. Through ANN modelling, it is possible to model linear as well as non-linear relationships (Leong *et al.*, 2020; Ooi and Tan, 2016; Sharma and Sharma, 2019). The limitations of traditional modelling methods can be overcome by using ANN, which is effective in noise, outliers, and small sample limitations (Leong *et al.*, 2020). However, due to the ANN algorithm's "black box" operation, ANN analysis is unsuitable for parametric hypothesis testing (Sim *et al.*, 2014). Therefore, an ANN analysis was employed along with MLR analysis to detect both linear and non-linear relationships and ensure the results' robustness (Ooi and Tan, 2016).

In order to examine the relative importance of the determinants of FL, we have used multi-layer perceptrons and sigmoid activation functions in SPSS 20 (Leong *et al.*, 2020; Sharma and Sharma, 2019). Like Leong *et al.* (2020) and Sharma and Sharma (2019), 90% of the samples were assigned for the training procedure and the remaining 10% for the testing procedure. The root means square of errors (RMSE) value was calculated using a ten-fold cross-validating procedure to avoid over-fitting (Leong *et al.*, 2020; Ooi and Tan, 2016). Similar to the procedures followed by Leong *et al.* (2020) and Ooi and Tan (2016), the sensitivity analysis was carried out once the average relative importance of 10 neural networks was calculated. Each predictor's normalised importance was calculated by dividing the average relative importance of each predictor by the highest relative importance value.

4. Results and discussion

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of the variables used in the study. On average, the respondents are 49 years old, with a minimum age of 23 and a maximum age of 75. All respondents are literate, and only 28.5% have completed higher education and above. 46.5% of the respondents are not working, and 83% belong to families with an annual income of less than Rs. 25,000. Half of the respondents live in a nuclear family, and a majority of the respondents are married. Around 60% of the respondents participated in the FL promotion programmes. Regarding PSMFA, the respondents have an average score of 2.61 out of a maximum possible score of 4.

Table 1. Descriptive statistics

Variables		Observations	Percentage
Educational qualifications	Below higher secondary education	143	71.5
	Higher secondary education and above	57	28.5
	Total	*200*	*100.0*
Family income (monthly)	Less than Rs. 25,000	166	83.0
	More than Rs. 25,000	34	17.0
	Total	*200*	*100.0*
Occupation	Working	107	53.5
	Not working	93	46.5
	Total	*200*	*100.0*
Type of family	Joint family	94	47.0
	Nuclear family	106	53.0
	Total	*200*	*100.0*
Marital status	Married	168	84.0
	Unmarried/widowed	32	16.0
	Total	*200*	*100.0*
Participation in SHG-based FL promotion programmes	Yes	119	59.5
	No	81	40.5
	Total	*200*	*100.0*

	Mean	Std. Deviation	Minimum	Maximum
Age	49.78	10.31	23	75
PSMFA score	2.61	0.664	1	4
Financial literacy score	14.26	2.624	7.67	21

Source(s): Authors' own work

The average FL score among the respondents was 14.26 out of a maximum possible score of 21. The respondents correctly answered 67.90% of the FL questions with a minimum score of 7.67 and a maximum of 21. Compared to the OECD's (2020) women's average FL score of 12.5, the Kudumbashree NHG members scored 1.76 more.

4.2 MLR results

As an initial step in the MLR analysis, this study has verified that the model adheres to key assumptions of multivariate analyses concerning normality, homoscedasticity, autocorrelation, and collinearity (refer to Appendix I) (Hair *et al.*, 2017). After ensuring the model's adherence to statistical assumptions, we evaluated its overall significance and goodness of fit. Table 2 summarises regression estimates along with F statistics and adjusted R^2. F statistics (5.88, $p < 0.01$) clarified that the independent variables significantly predict respondents' FL. There is a statistically significant difference among the independent variables. Hence, the regression model is a good fit for the data. Further, an adjusted R^2 value of 0.164 reveals that the model predicts 16.4% of changes in FL.

The regression analysis indicates that PSMFA positively influences the FL level of the SHG members (H1). Specifically, the model indicates that a one-point increase in the PSMFA score leads to a 0.5697 increase in the FL score. This supports the social constructivism-based statement that the PSMFA escalates the members' construction of social meanings and realities about money. Similarly, previous studies like Heaton *et al.* (2014) and Singh *et al.* (2017) also stated that participation in community-based groups fosters members' knowledge, attitudes, and behaviours through their interactions and mutual trust. Participation in

Table 2. Regression estimates

Predictor	Estimate	*p*
Intercept	10.6407	<0.001
Age	0.0166	0.402
Marital status		
Married – (Ref.: Unmarried or Widowed)	−0.0352	0.945
Family type		
Nuclear family – (Ref.: Joint family)	0.4860	0.159
Educational qualifications		
Higher secondary and above – (Ref: Below higher secondary qualification)	2.1978	<0.001***
Occupation		
Working – (Ref.: Not-working)	−0.0227	0.949
Family income (monthly)		
More than Rs. 25,000 – (Ref.: Less than Rs. 25,000)	1.2126	0.012**
PSMFA	0.5697	0.032**
Participation in SHG-based FL promotion programmes		
Participated – (Ref.: Not participated)	0.4412	0.216
F	5.88***	
Adjusted R^2	0.164	
Observations	200	

Note(s): ***, ** and * indicate estimates are significant at 1, 5 and 10% levels, respectively
Source(s): Authors' own work

community-based financial activities, interactions, and collaborations constructs knowledge and understanding of the sophisticated financial world and enhances the ability and skill needed for effective financial choices. Further, PSMFA also opens a window for regular and periodic meetings among women and the continuous discussion and exchange of money-related matters. The suggestions and advice gained at the meeting are bound to have a beneficial and desirable effect on the members' FL. Therefore, SHG provides an environment conducive to improving the FL level of its members.

Conducting financial education and awareness programmes through SHGs would be highly advantageous. However, the study indicates that participation in SHG-based FL promotion programmes does not impact the FL of the members (H2). This is consistent with Carpena and Zia (2020), who found that FL programmes had little or no impact on FL. Results suggest that the current FL programmes, which are short-term in nature, offered by Kudumbashree NHG are ineffective in enhancing members' FL, as many financial education programmes are short-term in nature and classroom-based, resulting in minimal impact. Hence, it becomes imperative to modify existing FL programmes or implement tailor-made ones to ensure the efficacy of financial education.

Moreover, demographic and socio-economic factors such as education level and family income exhibit a statistically significant positive effect on the FL level of the SHG members (H3). Compared to SHG members with less than higher secondary education, those with higher secondary education and above have a higher FL score of 2.1978. The results indicate that higher educational attainment contributes to increased SHG members' FL, supporting the results of Potrich *et al.* (2015) and Santini *et al.* (2019). This may be due to the positive relationship between cognitive ability and FL (Muñoz-Murillo *et al.*, 2020). Similar to the results of Santini *et al.* (2019), our results also corroborate that living in a higher-earning family leads to greater FL. SHG members from higher-earning families have a higher level of FL than those from lower-earning families. The SHG members belonging to the households earn a monthly family income of more than Rs. 25,000 have a higher FL score of 1.2126 than the SHG members of households earning less than Rs. 25,000 per month. However, the present study's findings fail to support the claims of Lusardi and Mitchell (2011) that being employed

or having a higher occupation level influences FL. Educational qualifications and family income wield a more pronounced influence on FL because higher levels of education enhance cognitive abilities, while increased family income offers greater opportunities for utilising finances diversely, thereby significantly influencing FL.

Our finding that age does not significantly affect FL is contradicted by previous studies (Kadoya and Khan, 2020; Lusardi and Mitchell, 2011), which reported a positive or non-linear effect. The SHG members' FL is not influenced by their family type, which contradicts the finding of Singh and Singh (2023) that a person living in a nuclear family has higher financial knowledge than those living in a joint family. Similarly, there is no significant difference between married and unmarried/widowed SHG members in terms of their FL level, which is in line with the findings of Potrich *et al.* (2015) and Kadoya and Khan (2020) that married women's FL is not significantly different from that of unmarried or widowed women. However, it contradicts the findings of Kiliyanni and Sivaraman (2016) that married women have more FL than unmarried women. Apart from educational qualification and family income, other demographic and socio-economic characteristics do not influence the FL of SHG members. This is likely due to the homogeneous nature of SHG members, typically aged between 40 and 60 and predominantly engaged in the informal sector where the skills and knowledge required are relatively low.

4.3 ANN results

The average RMSE values for the training and testing procedures were 0.13 and 0.12, respectively (refer to Table 3). Since the RMSE value is minimal and similar to the findings of Leong *et al.* (2020) and Ooi and Tan (2016), we confirmed the existence of an excellent model fit and a very high degree of prediction accuracy.

The results of the sensitivity analysis showed that the most important predictor of FL is PSMFA, followed by educational qualification (99.7%), family income (70%) and age (64%). ANN results confirm the robustness of MLR results since all three variables, namely, PSMFA, educational qualification, and family income, were the top three predictors of FL among the SHG members under both MLR and ANN analyses.

5. Conclusion

This study makes noteworthy contributions by exploring how PSMFA and participation in SHG-based FL promotion programmes influence women's FL. Results show that women's PSMFA enhances their FL level. However, participation in SHG-based FL promotion programmes does not influence their FL. Therefore, the study concludes that SHGs can serve as an effective platform for implementing and evaluating initiatives related to financial inclusion and FL, particularly among women and other marginalised sections of society.

5.1 Theoretical implications

The study makes a significant theoretical contribution to the FL literature by bringing novel insights about the relationship between PSMFA and FL. To the best of our knowledge, the present study is the first to analyse the impact of PSMFA on the FL. This contribution provides a foundation for further research on the relationship between PSMFA and FL, as well as how SHGs can be leveraged to enhance FL and exhibit desirable financial behaviour. Further, this finding extends the application of social constructivism to the realm of money and demonstrates how social interactions and collaborations within community-based organisations contribute to the construction of knowledge and meanings about money. Theoretically, this study contributes to the existing knowledge by highlighting that traditional financial education efforts have had a muted impact on FL, as evidenced by the insignificant relationship between them. Consequently, there is a need for in-depth research to develop and

Table 3. Importance and RMSE values

Independent variable (importance)	Neural network 1	2	3	4	5	6	7	8	9	10	Average importance	Normalised importance
PSMFA	0.05	0.33	0.21	0.33	0.25	0.26	0.14	0.32	0.32	0.20	0.24	100%
EQ	0.12	0.34	0.28	0.34	0.31	0.24	0.21	0.21	0.21	0.14	0.24	100%*
FI	0.26	0.12	0.13	0.12	0.20	0.15	0.25	0.12	0.12	0.23	0.17	70%
AG	0.10	0.12	0.19	0.12	0.04	0.24	0.18	0.19	0.19	0.14	0.15	64%
PSFLP	0.26	0.01	0.06	0.01	0.06	0.04	0.11	0.02	0.02	0.05	0.06	27%
OCU	0.14	0.01	0.01	0.01	0.01	0.01	0.03	0.09	0.09	0.14	0.05	22%
FT	0.02	0.05	0.08	0.05	0.11	0.06	0.01	0.04	0.04	0.03	0.05	21%
MS	0.05	0.01	0.02	0.01	0.03	0.00	0.07	0.01	0.01	0.08	0.03	13%
SSE											Average	Std. Dev.
Training	3.46	2.87	3.15	2.87	2.76	2.77	3.09	3.19	3.19	3.24	3.06	0.23
Testing	0.17	0.26	0.44	0.26	0.37	0.37	0.26	0.25	0.25	0.44	0.31	0.09
RMSE												
Training	0.14	0.13	0.13	0.13	0.12	0.13	0.13	0.13	0.13	0.14	0.13	0.01
Testing	0.10	0.11	0.14	0.11	0.13	0.13	0.12	0.11	0.11	0.14	0.12	0.01
Sample size												
Training	184	179	176	179	179	178	182	180	180	177		
Testing	16	21	24	21	21	22	18	20	20	23		

Note(s): PSFMA: Participation in SHG-based Micro-financial Activities, EQ: Educational Qualifications, FI: Family Income AG: Age, PSFLP: Participation in SHG-based Financial Literacy Programmes, OCU: Occupation, FT: Family Type and MS: Marital Status. * 99.7% rounded off to 100%. SSE: Sum square of errors and RMSE: Root mean square of errors

Source(s): Authors' own work

promote effective, tailor-made financial education initiatives specifically designed for implementation through SHGs.

5.2 Practical implications

The findings of this study offer valuable practical implications for government, financial institutions, and SHG. Since PSMFA improve FL, the government and policymakers might use SHGs as a channel to accelerate the penetration of both financial inclusion and FL among women, thereby enabling women to achieve economic empowerment. The same can be adopted to enhance the financial inclusion and FL of other marginalised sections of the society. Further, central and state governments, as well as banks and other financial institutions, can use SHGs as an effective platform to disseminate financial information for updating the members about various changes that are taking place in the financial market and raise awareness about scams and malpractices skyrocketing in the financial sector. The Kudumbashree Community Network model can be utilised to popularise the financial products and various financial schemes implemented by both central and state governments, as this network has already been proven effective in communicating and executing various state- and centrally-sponsored schemes in Kerala.

Finally, the SHG should introduce a long-term-based FL programme for the effective financial education of their members because the current FL promotion programmes offered by SHGs are ineffective. While SHG's current financial education sessions are short-term and aim to raise awareness about financial products and transactions, there is a scarcity of programmes focusing on real-life financial contexts and practical skills for sustained impact. It necessitates introducing specially engineered financial education programmes incorporating real-life scenarios and practical sessions by the SHGs, banks, and other financial institutions to improve individuals' long-term financial well-being.

5.3 Limitations and scope for future research

Notwithstanding its contributions to the field of personal finance, it is acknowledged that the present study has certain limitations. The present study has only focused on NHG members belonging to a single district mission of Kudumbashree NHG due to time and resource constraints, limiting its scope. Future research could broaden this scope by including SHG members from multiple district missions across the state, as well as extending to SHG members both within and outside the country, which may provide valuable insights. Future studies can also use a mixed-method approach to enhance the understanding of the impact of PSMFA on FL and develop a validated PSMFA scale. A validated PSMFA scale could yield more reliable results than the composite index used in this study.

Notes

1. Refer to https://www.kudumbashree.org/pages/171 for further reading about Kudumbashree.
2. Refer to https://www.oecd.org/financial/education/2018-INFE-FinLit-Measurement-Toolkit.pdf for the OECD Toolkit for measuring FL and procedures for the calculation of FL score.

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