

BMJ Open Development and validation of the Social Capital Assessment Tool in pregnancy for Maternal Health in Low and middle income countries (LSCAT-MH)

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ABSTRACT

Objectives Social capital which implies ‘features of social organisation, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions’ is rarely assessed in relation to maternal health in low/middle-income countries (LMICs). A main reason for this research gap could be the unavailability of a specific tool to measure social capital in pregnancy. The study developed and validated an instrument to measure social capital among pregnant women.

Setting We developed the tool based on World Bank Social Capital Assessment Tool and its adaptations identified as applicable to LMIC from an initial systematic review. The study was conducted in Anuradhapura district in the North Central Province of Sri Lanka. Validation process was conducted in urban, rural and resettled communities.

Participants Study participants of the cognitive validation included pregnant women from the three communities, and an expert panel including a social scientist, methodological expert, subject expert, public health officers. The psychometric validation was performed on 439 pregnant women permanently residing in the three communities.

Results The 24-item Low and middle income countries Social Capital Assessment Tool for Maternal Health (LSCAT-MH) demonstrated high internal consistency (Cronbach’s $\alpha=0.94$). Factor analytical methods suggested a four-factor model of (1) neighbourhood networks (structural bonding), (2) domestic and neighbourhood cohesion (cognitive bonding), (3) social contribution and (4) social participation (structural bridging). Concurrent validity with antenatal mental ill health was confirmed through a negative correlation with the Edinburgh Postpartum Depression Scale. Test–retest reliability was high with intraclass correlation of 0.71 and a Pearson correlation of 0.83.

Conclusion The LSCAT-MH is a psychometrically valid and reliable tool to measure social capital in pregnancy. Predictive validity was not tested as the study was not a longitudinal follow-up.

INTRODUCTION

The global maternal health agenda currently focuses on ‘obstetric transition’, where

Strengths and limitations of this study

- This study describes the development of a tool to measure social capital in pregnancy, related to maternal health in low/middle-income countries.
- The tool development process is comprehensive including a systematic review, an in-depth qualitative exploration, cognitive and psychometric validation.
- The new tool (Low and middle income countries Social Capital Assessment Tool for Maternal Health (LSCAT-MH)) possesses adequate reliability, face validity, construct validity, concurrent validity and cross-cultural validity.
- Predictive validity of the tool should be further tested using longitudinal studies.

countries gradually shift from high to low maternal mortality and fertility and from direct causes to indirect causes of maternal deaths.¹ This phenomenon directs international community to view ‘social development’ as an important aspect in elimination of preventable causes of maternal deaths.^{2 3} The observation on social development is yet to be incorporated into the global movement of maternal health.

Social capital is defined as ‘features of social organisation, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions’.⁴ It has two major dimensions. Cognitive social capital refers to norms, beliefs and values that determine mutual benefit.⁵ Structural social capital refers to externally observable relationships among people.⁶ A more recent approach expresses these same dimensions in three distinct forms: ‘bonding’, ‘bridging’ (horizontal) and ‘linking’ (vertical) social capital.⁷

Social capital, a major social determinant of health is scarcely used in relation to

maternal health specially in low/middle-income countries (LMICs).⁸ In reducing maternal mortality, the global initiatives were aimed on providing basic and emergency obstetric facilities, improving physical well-being of mother and the fetus and risk assessment for medical and obstetric problems. Social aspects to health were rarely addressed as more priority was given to the mentioned fields. Few available studies on social capital and maternal health show that high social capital during pregnancy is associated with higher levels of self-rated health,⁹ lower levels of postpartum psychosis¹⁰ and health-related behaviours.¹¹ The qualitative studies indicate that cognitive social capital tend to reduce daily life stressors, increase psychosocial satisfaction and provide the perception of care during illness, whereas structural social capital reduces minor ailments in pregnancy and provide care during medical emergencies and illnesses. Together, both these dimensions are found to promote mental and physical well-being of a pregnant woman.¹² However, methods used to assess maternal social capital quantitatively have ignored the fact that the social capital in pregnancy could be unique (with increased bonding in the micro community, restricted bridging and highlighted linking to health services). This uniqueness is well elaborated in the initial extensive qualitative study we have conducted in the specific community¹² as well as in other quantitative studies done on maternal populations.⁸

To overcome this challenge, specific tools are required to assess social capital in pregnancy. Numerous approaches have been used to measure social capital though there is no gold standard measure.¹³ Our recent systematic review on methods of measurement of social capital in LMICs indicate that only half of the studies used a specific tool and very few culturally adapt and validate them.¹⁴ To date, there is no specific tool available to measure social capital of pregnant women. As described by the Commission for Social Determinants of Health, ‘measuring the problem and assessing the impact of action’,¹⁵ is integral to incorporate social development as a strategy to reduce maternal mortality.

The present study aims on the development and validation of a tool to measure social capital in relation to maternal health. The study was carried out in Sri Lanka, as a model LMIC which has been exemplary to the world in maternal and child healthcare provision.

METHODS

Low and middle income countries Social Capital Assessment Tool for Maternal Health (LSCAT-MH) was developed in three main phases (figure 1). The systematic review to identify the best tools available for LMICs,¹⁴ and a qualitative study among pregnant women and key informants to identify the sociocultural context of social capital^{12 16} are already published^{12 14 16} and briefly described below. This paper presents the contextual adaptation and psychometric evaluation.

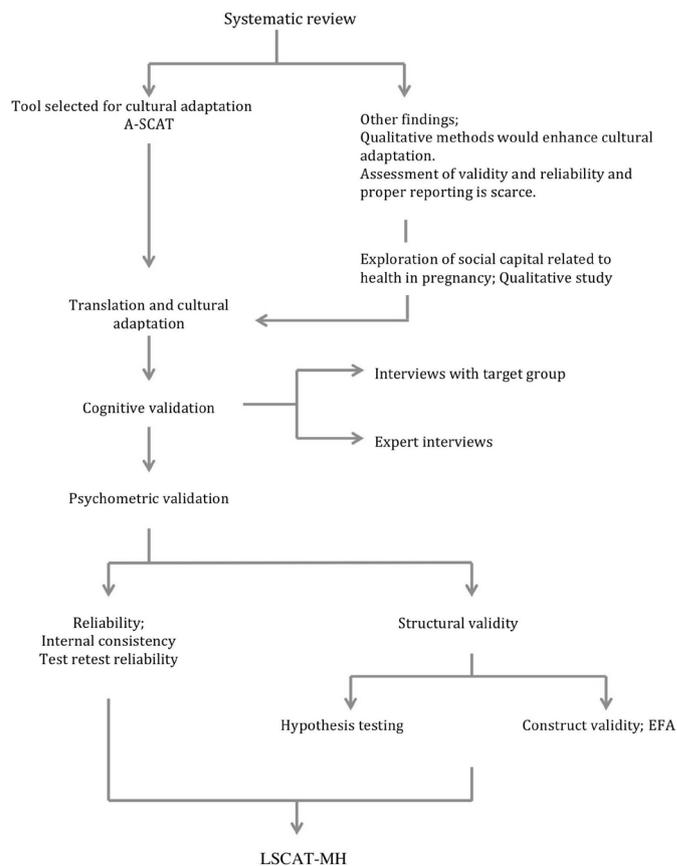


Figure 1 Development flow chart of LSCAT-MH. A-SCAT, Adapted Social Capital Assessment Tool; EFA, exploratory factor analysis; LSCAT-MH, Low and middle income countries Social Capital Assessment Tool for Maternal Health.

PREREQUISITES FOR TOOL DEVELOPMENT

Systematic review

A systematic review conducted on methods of measurement of social capital and health identified the Adapted Social Capital Assessment Tool (A-SCAT) (Harpham *et al*),¹³ as one of the most suitable to use in health surveys. This tool¹⁷ is adapted from the Social Capital Assessment Tool (SCAT) developed by the World Bank.¹⁸

Qualitative exploration of social capital in pregnancy

To assess the context and composition of social capital in pregnancy, we explored social capital in pregnancy using several qualitative techniques including diaries written by pregnant women (n=41), diary interviews and in-depth interviews with primary healthcare officers and senior community dwellers (n=16).¹⁶ Ten cognitive and five structural constructs of social capital relevant to pregnancy were identified. Domestic and neighbourhood cohesion were strong social constructs during pregnancy. Social contribution was identified as a novel construct. This study revealed that current tools available did not contain the relevant constructs to capture the unique dimensions of social capital in pregnancy and led to this study.

Development of LSCAT-MH

We used the methods proposed by Sumathipala and Murray¹⁹ for translation and cross-cultural validation of the English version of A-SCAT to Sinhala language, the vernacular in Sri Lanka. The main social capital constructs and descriptors of pregnant women identified by the qualitative study¹² were used to develop LSCAT-MH. This process included three steps:

1. Making the tool applicable for pregnant women rather than the general public.
2. Adapting it to different social contexts.
3. Changing the item stems to measure individual rather than community social capital.

In this procedure, we developed new items (domestic cohesion, social contribution), omitted few (general collective action, socialising, perceived influence, degree of citizenship) and changed the descriptors and item stems based on the qualitative study.

Validation of LSCAT-MH

We conducted both cognitive and psychometric validation based on standard guidelines for tool development²⁰ including the COnsenses-based Standards for the selection of health Measurement INstruments (COSMIN) checklist.²¹

Cognitive validation

The intended referential and connotative meanings of items in the A-SCAT were obtained by personally contacting the developers of original A-SCAT and SASCAT (Short version of Adapted Social Capital Assessment Tool; Trudy Hapham and Mary De Silva). These original meanings were refined using the results of the qualitative study and were rewritten with the agreement of the local investigators. A selected list of criteria was used in expanded interviews and expert evaluation to judge the appropriateness of the survey questions.²²

Expanded interviews with the target group (pregnant women)

We divided the questionnaire into four to five items. In the first step, the original question was delivered to the participant to elicit the answer. In the second step, each participant was asked for the perceived meaning of each question. The participants were also asked to explain their thought process as to how they came up with their answer. The perceived meaning was compared with the original intended meaning. Respondent validation was used to confirm whether the respondents perceived the intended meaning or if the question meant something different to them. In the third step, the respondents were interviewed on the quality and acceptability of the questionnaire.

Expert evaluation

A panel of experts (n=7, three men and four women) reviewed the culturally adapted version of the study tool. The panel included a native language expert, a social scientist, a methodological expert, a subject expert (community physician) on maternal health, a Public Health Nursing Sister and a Public Health Midwife .

Table 1 Intended task and experts involved in content analysis

| Intended task | Expert/resource person |
|---|--|
| Assess whether all items refer to relevant aspects of the construct to be measured? | Social scientist, subject expert |
| Assess whether all items are relevant for the study population? | Social scientist, Public Health Nursing Sister , Public Health Midwife |
| Assessment of whether all items are relevant for the purpose of the measurement instrument? | Subject expert, methodological expert |
| Assess whether all items together comprehensively reflect the construct to be measured? | Subject expert, methodological expert |
| Assess the methodology of the study | Methodological expert |

Written comments for each item were collected. The experts were informed of the intended tasks (table 1).

Data obtained by cognitive validation procedure were reviewed question-by-question basis and modifications were made before progression to formal reliability and validity field tests:

Reliability

1. Internal consistency (the degree to which items in a single dimension co-vary) was measured using Cronbach's α (0–1, 1 indicating greatest internal consistency).
2. Test–retest reliability was performed in a subsample of 50²⁰ pregnant women in the second trimester. The gap between two data collection points was 2 weeks. Intraclass correlation (ICC) was used to assess the reliability (0–1, 1 indicating the greatest reliability).

Validity

Face validity was assessed through the cognitive and expert approaches described above.

Construct validity evaluates the degree to which the items in a measure assess the construct of interest. In addition to the overlap with the cognitive validity testing above, we assessed the structural validity²¹ with exploratory factor analysis (EFA) using a maximum likelihood method using Statistical Package for Social Sciences.⁵

Concurrent validity was evaluated by assessing the correlation of scores with a hypothesised similar construct: mental health in pregnancy (antenatal anxiety and depression). This was measured using, the Edinburgh Postpartum Depression Scale, expecting a negative correlation.

Item endorsement ratio was used to remove the items that had minimum discrimination ability (only the items with an endorsement ratio of 0.2–0.8 were included).

Study setting, participants and sample

A cross-sectional study was conducted in Anuradhapura district (the largest district) of Sri Lanka. Total population of Anuradhapura is 886945. In this district, more than 19 000 pregnant mothers are registered annually for antenatal care.²³ Demographic and Health Survey data show that antenatal care coverage through public health system is 100%, and 90% of females in the district have at least entered secondary level education.²⁴ The maternal mortality ratio of Anuradhapura district in 2016 is 38.9 per 100 000 live births, slightly higher than the national average (33.8/100 000 live births). We purposefully selected three Medical Officer of Health (MOH) areas from the whole district representing urban–semiurban (Nuwaragam Palatha East—NPE), rural (Nuwaragam Palatha Central—NPC) and resettled (Rajanganaya) populations based on the observed differences in social capital in the qualitative study. During July to October 2016, maternal clinics were assigned for data collection according to the population proportion. Eligible pregnant women participate in the study.

Sample size for validity testing

Sample size depends on the communalities and overdetermination of the factors.²⁵ The overdetermination (variable : factor ratio) was taken as minimum 6:1 (30 variables, 5 factors). We decided on a sample size of 500 (with a subject : variable ratio of 15:1 and a non-respondent rate of 10%).²⁶ The sample size for hypothesis testing of concurrent validity was calculated to accommodate 10 predictors with a minimum expected correlation of 0.1 for each predictor variable, with an effect size of 0.1, an alpha error probability of 0.05 and a power of 0.95. The resultant sample size for hypothesis testing was 254. Adding 10% for non-respondents, the total sample size required 267 pregnant women.

Data collection

We used a brief questionnaire on sociodemographic and pregnancy-related factors, the LSCAT-MH in Sinhala (*interviewer administered*) and the validated Sinhala version of Edinburgh Postpartum Depression Scale (EPDS) (*self-administered*). Trained pre-intern medical officers performed the interview and data collection.

Patient and public involvement

This study involved pregnant women, public health officers and senior community dwellers. Their perceptions on social capital in pregnancy were well explored in the qualitative component which was used in the development of culturally adapted items and item response mechanisms for the new tool. The opinion and the experience of MOHs were gathered in selecting the communities. Informal discussions as well as in-depth interviews were conducted with the public mentioned above to have inputs in designing. Social scientists, subject experts and methodological experts' views were obtained in cognitive validation process. The results of the study will be

disseminated at routine public health conferences at divisional, regional and national levels.

RESULTS

Cognitive validation of questions and responses

Participants identified 'community' as the 'area surrounding their residence'. Almost all the items were interpreted with the same intended meaning and the thought process was rational in terms of that was expected. We tested the two types of response scales²⁰: Likert (Fully agree, agree, neutral, disagree, fully disagree) with adjectival (always, often, sometimes, rarely and never). Respondents unanimously agreed that adjectival scale was more applicable and the cognition process was easier.

Domestic cohesion

The thought process was very quick and items were deemed relevant for most. The women whose domestic cohesion seemed to be disrupted took additional time to answer often visualising the situations where it was disrupted while coming to the answer. Some argue whether domestic cohesion should be included in social capital. It is important to mention that the family is the smallest 'social structure'²⁷ of a society, and especially in pregnancy where the 'microcommunity' and 'bonding social capital'⁵ seem to play the major role,¹² the cognitive validation indicated that domestic cohesion should be an integral component of capital that would serve a woman during pregnancy.

Neighbourhood cognitive social capital

This included items on sense of belonging, trust and reciprocity, enjoying being with neighbours, perception of love and care and loneliness. Participants who possessed rich bonding and trust readily answered the questions. The participants who selected responses 3–4 took a little more time to answer. When probed, they reported that 'some people we can trust, but not all'. Most of these participants recalled minor incidents which demonstrated a break in trust with the neighbourhood. We observed that participants who had less trust, despite reporting high cohesion in other neighbourhood cognitive constructs, mentioned that they felt lonely.

Social support

All social support items were very clear to the participants.

Neighbourhood structural social capital

Although we asked for the frequency of engagement in different types of social connections, there was difficulty in interpretation. Therefore, we included a statement under these items asking the interviewer to explain.

Social contribution

Items on social contribution were well understood with an example given. These items had high individual variability.

Trust in services

Asking about the trust in services did not elicit credible answers except for those assessing public health and specialist car services. When asked about other services, participants (especially from rural communities) almost always selected the response 'greatly trust'. There were two aspects why we thought this answer was not credible. Pregnant women tended to concentrate on self and the immediate microcommunity and they had difficulty interpreting or thinking about other services. Second, they did not have any exposure to services available elsewhere to genuinely evaluate the services that they receive.

Group membership

Although the question was clear, pregnant women had less interest in social groups. When asked, they reported that although before pregnancy they used to attend but now the husband or another family member would attend, almost as though they were excused from attending. It was observed that during pregnancy these ties tended to become weaker as the women limited their interaction to only to the immediate surrounding. However, it was observed that preference to attend committees varied across different communities, the most common being the funeral committee.

Expert evaluation confirmed the relevance and comprehensiveness of the tool.

Endorsement ratio

Although we included 40 variables representing social capital, only the 30 items with an endorsement ratio between 0.2 and 0.8 were selected for the psychometric validation²⁰ (online supplementary material).

Psychometric evaluation

Description of the study sample: Of the 472 pregnant women who participated in the study, 439 provided complete data (table 2). The mean social capital score for this sample was 92.4 with an SD=8.83 (figure 2). The percentage of missing values was 6.5% for social capital and 8.2% for EPDS and was managed using pairwise (in hypothesis testing) and listwise deletions (in EFA and total scores).

Construct validity

In factor analysis with maximum likelihood ratio and oblimin rotation, the Kaiser-Meyer-Olkin value was 0.92. Bartlett's test of sphericity reached statistical significance supporting the factorability of the correlation matrix. These tests confirm that the data set is suitable for factor analysis to be conducted. Inspection of the scree plot revealed a clear break after the fourth factor (figure 3). Parallel analysis also revealed four factors, explaining a cumulative variance of 83.5%. These were termed informal neighbourhood networks (structural bonding), domestic and neighbourhood cohesion (cognitive bonding), social contribution (bonding and bridging) and social participation (bridging) (table 3). Group membership and trust on health services were not included in factor analysis

Table 2 Characteristics of the study sample

| Characteristic | Count | % |
|-----------------------------------|-------|-------|
| Age (years) | | |
| <20 | 24 | 5.50 |
| 20–35 | 373 | 85.00 |
| >35 | 42 | 9.50 |
| Family type | | |
| Nuclear | 237 | 50.5 |
| Extended | 232 | 49.5 |
| Family income (US\$/day) | | |
| <2 | 13 | 2.8 |
| 2–2.99 | 17 | 3.6 |
| 3–4.99 | 55 | 11.7 |
| 5–9.99 | 356 | 75.7 |
| ≥10 | 26 | 5.5 |
| Parity | | |
| 1 | 169 | 37.10 |
| 2 | 175 | 38.50 |
| ≥3 | 111 | 24.40 |
| Gestational age (weeks) | | |
| <14 | 103 | 22.20 |
| 14–28 | 180 | 38.80 |
| >28 | 181 | 39.00 |
| Highest level of education | | |
| Upto grade 5 or less | 6 | 1.30 |
| Upto grade 10 | 113 | 24.20 |
| Passed O/L | 184 | 39.50 |
| Passed A/L | 129 | 27.70 |
| University education | 34 | 7.30 |
| Population type | | |
| Urban–semiurban | 208 | 45.10 |
| Rural | 128 | 27.80 |
| Resettled | 89 | 19.30 |
| Other | 36 | 7.80 |

as they contained only a single item each and from the cognitive testing appeared of little relevance to his group.

Concurrent validity

We found a weak negative (−0.269) but significant (p=0.000) correlation between social capital and mental health in pregnancy.

Cross-cultural validity

The mean social capital score was significantly different (p<0.001) between the three different contexts with the lowest social capital reported in the urban/semi-urban population of NPE MOH area (mean 90.3, SD ±9.2). Highest social capital was reported in NPC, a rural community (mean 95.2, SD ±7.8). The resettled

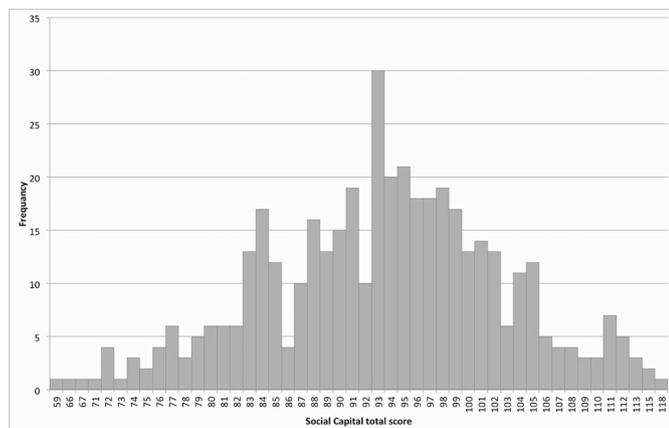


Figure 2 Distribution of social capital scores in the study population.

population at Rajanganaya had a total score of 92.7 with an SD of ± 8.5 . The different findings confirmed the descriptions of social capital elicited in the qualitative studies.

Reliability

The total scale demonstrated high internal reliability (Cronbach's α 0.94) with each factor's internal reliability ranging from 0.92 to 0.94. In test-retest reliability, the ICC was 0.71 for the total scale (structural bonding, 0.73; structural bridging, 0.67; social contribution, 0.80 and cognitive bonding, 0.67).

DISCUSSION

To our knowledge, LSCAT-MH is the only tool available to date, specifically measuring the social capital of women during pregnancy in LIMC. It will facilitate capturing social determinants of, and outcomes of interventions aimed at improving, maternal health.

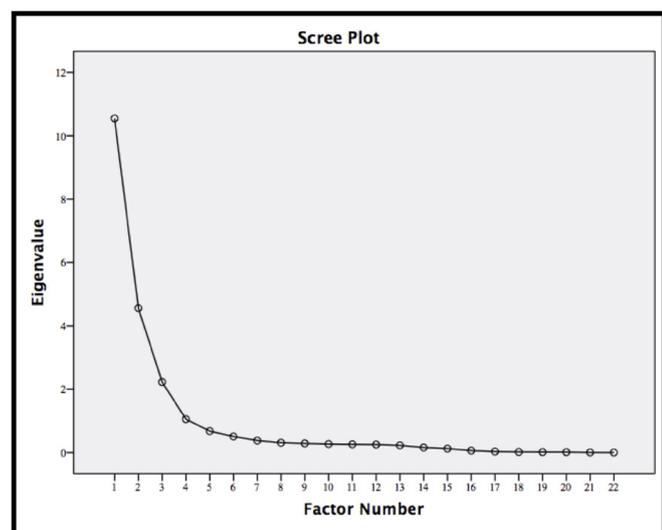


Figure 3 Scree plot of exploratory factor analysis of social capital in pregnancy.

The psychometric strength of LSCAT-MH as a tool of measurement of social capital should be high as we adhered to strict and comprehensive procedures in tool development.^{20 21} The scale demonstrates high content validity, structural validity, construct validity, concurrent validity, internal consistency and reliability while it was observed that not all these properties are mentioned in most of the tools that measure social capital. Importantly, the cultural adaptation and the adaptation of the tool for pregnancy was based on in-depth qualitative observations and interviews which is rarely adhered to in the development of tools for social capital in literature. LSCAT-MH does not stand alone as 'another new tool' which has been a burden to the measurement of social capital. It exerts refinement of already developed tools (SCAT, A-SCAT and SA-SCAT) by experts in the field, which is essential in approaching toward a gold standard measure.²⁸

The dimensions extracted (neighbourhood networks, domestic and neighbourhood cohesion, social contribution and social participation) collate with the accepted dimensions of social capital (table 2). In addition to distinguishing structural from cognitive social capital, extraction also distinguishes between bonding and bridging (structural) social capital. We think that the four-factor model extracted in LSCAT-MH validation is more robust to other tools as it exerts above different dimensions. Our recent systematic review indicates that social trust, sense of belonging, social cohesion, social support and group membership as the most associated constructs of social capital to health.¹⁴ During the long procedure of its development, LSCAT-MH has been able to retain all above constructs within the tool. We retained group membership as a single item for the integrity of the concept and as it had favourable endorsement value. The tool reflects that social capital in pregnancy in LMICs comprise more bonding and less bridging dimensions.

Social contribution is a relatively novel construct that we included in the tool, which emerged as a separate factor and distributed adequate internal consistency and reliability with the other constructs. It might show similarity to 'perceived social responsibility' assessed in few tools.²⁹ We argue that it is an important aspect of social capital concept as denoted by 'mutual benefit'⁴ in the development of its notion, while most tools tend to measure the one-way process (what people get). This will also read 'maternal social capital' which is unique from general population but consistent with women in all types of communities in the developing world. In EFA, the four items on social support did not come together as in routinely known dimensions. They fall into different factors structural and cognitive (but both bonding) and implies with the real-life reflections that were observed. Instrumental and financial support reflected the cognitive nature of domestic and neighbourhood cohesion indicating that it is a sort of a perceived capital gained from the surrounding, while emotional and informational support were seen as structural. The qualitative studies indicate that 'getting or giving emotional support'

Table 3 Social capital dimensions extracted in EFA

| | Factor | | | |
|--|--------|--------|-------|--------|
| | 1 | 2 | 3 | 4 |
| Domestic and neighbourhood cohesion (cognitive bonding) | | | | |
| 'There are times when me and my husband' argue and quarrel | | -0.409 | | |
| 'family members argue and quarrel' | | -0.59 | | |
| 'People in this neighbourhood treat me as their own' | | -0.878 | | |
| 'I feel loved and cared for by my neighbours' | | -0.879 | | |
| 'I enjoy spending time with my neighbours' | | -0.878 | | |
| 'In this neighbourhood, we help each other with our needs' | | -0.694 | | |
| 'In general my neighbours are trustworthy' | | -0.651 | | |
| 'There is someone who can help me with my household chores' | | -0.797 | | |
| 'In emergency, there is someone who can help me financially' | | -0.691 | | |
| Informal social networks (structural bonding) | | | | |
| 'There is someone who I can consult information/knowledge'. | 0.823 | | | |
| Meeting with friends or relatives in the neighbourhood | 0.63 | | | |
| Connecting with friends neighbourhood through telephone | 0.793 | | | |
| 'There is someone who can console me when I'm stressed' | 0.696 | | | |
| Social participation (structural bridging) | | | | |
| Participate in cultural events/festivals/trips | | | | -0.775 |
| Visit the city or the market | | | | -0.955 |
| 'People in this neighbourhood face a problem, I would join' | | | | -1.042 |
| Social contribution (bonding and bridging) | | | | |
| Work for yourself or someone else for pay | | | 0.978 | |
| Take responsibilities at home | | | 1.002 | |
| Take responsibilities for social activities in the neighbourhood | | | 0.847 | |
| Teach young ones | | | 0.88 | |
| Help a poor family | | | 0.995 | |
| Look after other children | | | 0.706 | |

Extraction Method: maximum likelihood.

Rotation Method: Oblimin with Kaiser Normalization.*

*Rotation converged in 10 iterations.

was not habitual in the home and the surrounding neighbourhood. It was perceived as a 'different act' away from the routine in these contexts.

Internal consistency of LSCAT-MH (0.92–0.94) was high compared with other social capital tools (0.5–0.86).¹⁴ Reliability is not reported in any of the SCAT tools. Test-retest reliability is assessed in very few occasions (0.5)³⁰ in tool development for social capital.

We expected and observed a negative correlation between social capital and mental health in accordance with current evidence.³¹ The direction and magnitude of association suggest credibility of the tool.²¹ In literature, studies on social capital and mental health rarely demonstrate correlation with smaller sample sizes as in this study. Usually they only present as associations between different quantiles of the social capital score and EPDS positiveness³² as a correlation is difficult to demonstrate unless rigorous measurements were

done. We believe that the LSCAT-MH is a better tool because it was able to demonstrate a significant negative correlation.

In the cognitive validation process, it was noted that the respondents felt that the adjectival scale is more applicable and the cognitive process was easier. This is a very crucial point in formulation of tools. The tool development standards do not differentiate the two scales in terms of outcome or applicability. However, we think that the Likert scale demand the respondent to make a decision regarding agreement to a statement and it includes a neutral position in the middle which is embarrassing for some statements which makes the scale less applicable and difficult to understand. The adjectival scale directly asks about the perception and is easily and quickly understood by the respondent. There might be a cultural and language factor as well which works in favour of selecting the adjectival scale.

Whether social capital is formative or reflective, and whether EFA versus confirmatory factor analysis (CFA) is the ideal as there is a large qualitative component reflecting the different constructs, would be an argument in this tool development process.³³ We would argue that the study is reflective within a broader formative frame where the first order is reflective (latent variables) and the second order is formative (social capital as a whole) as described as the type 2 model described by Javis *et al.*³⁴ In social capital which is known to be a multifaceted concept, a total score is generated for measurement purposes which is invariably formative in nature. But we think that the latent variables identified are reflective and would have different reflections on health. We conducted prior qualitative studies because the social capital in pregnancy is not described in literature. We wanted to identify the full scope of social capital, starting from zero which led to the in-depth inductive qualitative design. But as social capital do have a framework or already known dimensions, we grouped our findings of the qualitative study according to the available knowledge framework. Here, the constructs like social contribution that emerged new were added to the framework. Although we categorised what we found about social capital in pregnancy into known dimensions, at many instances we observed that the real-life verbatim in the qualitative study deviate from the known dimensions which can be explained only by the reflective nature within the context and in pregnancy. Therefore, we think that the already confirmed framework that we used to categorise the constructs is slightly different from the latent variables identified in the EFA. It is only after having these variables that we were able to see the importance of the reflective nature of social capital in pregnancy. Certainly, as the next step in validation it is recommended to perform CFA using the identified latent variables in a different sample of pregnant women which is the most appropriate procedure.

Although we adhered to standard procedures in tool development, there are several limitations. The tool was culturally adapted for semiurban–rural community in Sri Lanka. Any tool on social capital will need cultural adaptation to the context and the theme under study when used in a different setting. Group membership, trust in other services and trust in different types of health service provision may play a role in communities with higher disparities in services. Any of these can be incorporated to the tool if necessary. Item response theory (IRT) tests were not conducted, as the concept as a whole did not fulfil the basic assumptions.²⁰ However, IRT would have been performed for separate dimensions or we would have used multivariate methods to perform IRT. Cross-cultural validation was not performed in different countries though the tool was able to differentiate between three different types of communities. Although the initial qualitative studies and the cognitive validation were performed in communities with different educational backgrounds, the educational level of the study population for construct validity is relatively high and the district

possess satisfactory maternal health services. However, the educational levels in the current population simulate the national values for Sri Lanka. Therefore, the application of the tool to contexts with poor literacy and health services might need contextual adaptation. Criterion validity was not assessed, as there is no gold standard tool. Responsiveness²¹ could not be assessed as social capital does not seem to change over a reasonable time period during pregnancy and as we did not perform a longitudinal study. Due to the same fact we are unable to talk about the predictive validity although one could argue that in hypothesis testing we assess whether social capital during pregnancy could predict the mental health status at the time of data collection.

Availability of a measurement tool for social capital in pregnant women fulfils the prerequisite to ‘measure and understand’ the relationship of social capital to maternal health and would help in the ‘assessment of its impact’.³⁵ It would enhance future studies on social determinants governing maternal health in both local and global settings and especially in LMICs where 90% of maternal mortality occurs. As we have tested the reliability and validity of the social capital tool during pregnancy in a systematic manner, we believe that LSCAT-MH helps to better measure social capital in pregnancy, and thus it will help policy-makers to better evaluate social circumstances and to identify which specific aspects can be improved. Thus, this study carries an important link between research, policy and practice and will help in their strengthening.

Longitudinal studies should be carried out to evaluate how social capital could predict and affect health during pregnancy and its outcome.

CONCLUSIONS

LSCAT-MH is a valid reliable tool to measure social capital during pregnancy in semiurban to rural populations of Sri Lanka as a model of LMICs. Cultural adaptations are recommended in using different cultural settings in other LMICs.

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