

Original Research Article

Development and preliminary psychometric evaluation of a questionnaire assessing reproductive and pregnancy related risk factors for cardiovascular disease in Indian parous women

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ABSTRACT

Background: Reproductive and pregnancy related factors that contribute to cardiovascular risk in women are gaining traction. Structured documentation of these factors remains limited in Indian parous women. This study aimed to develop a questionnaire assessing reproductive and pregnancy related risk factors for cardiovascular disease (CVD), examine its preliminary psychometric properties, and explore associations between questionnaire derived factors and physical activity levels.

Methods: A cross-sectional observational study was conducted in gynecology units over 18 months after ethics approval and informed consent. A literature informed questionnaire was drafted, reviewed by experts for clarity and relevance, revised, pilot tested, and then administered along with the global physical activity questionnaire (GPAQ) to 377 parous women aged 20 to 40 years. The final instrument comprised 55 items.

Results: The questionnaire showed high internal consistency (Cronbach alpha=0.982). Structural assessment showed factor loadings of 0.31 to 0.54. Mean age, body mass index, and waist-hip ratio were 29.44 ± 3.85 years, 25.02 ± 2.69 kg/m², and 0.89 ± 0.05 , respectively. Based on physical activity classification, 151 (40.1%) women were sedentary, 122 (32.4%) were minimally active, and 104 (27.6%) were active. Physical activity categories showed significant associations with several reproductive and pregnancy related factors, including hypertension, hyperthyroidism, dysmenorrhea, polycystic ovarian syndrome (PCOS), gestational diabetes (GD), eclampsia, type of delivery, and postpartum depression.

Conclusions: The questionnaire demonstrated encouraging preliminary psychometric properties and was feasible for documenting reproductive and pregnancy related factors relevant to CVD risk in Indian parous women. Further validation is required before broader screening use.

Keywords: Cardiovascular disease, Parous women, Physical activity, Pregnancy, Psychometrics, Questionnaire, Reproductive health

INTRODUCTION

Globally, premature mortality from non-communicable diseases like CVD was identified as one of the leading causes of mortality. CVD is largely associated with a combination of behavioural and metabolic risk factors, such as physical inactivity, poor dietary habits, increase in weight, hypertension, high levels of blood sugar, and

dyslipidaemia.¹ In India as well, CVD contributes substantially to the burden of non-communicable disease and to premature deaths in adults, making early risk recognition an important public health priority.²

In women, CV risk assessment cannot be limited to conventional risk factors alone. Over the last few years, increasing attention has been given to gender related risk

factors arising from obstetric history. Both early and late onset of menarche, along with conditions such as PCOS, infertility, GD, pregnancy-related hypertensive conditions, preterm birth, and other unfavorable pregnancy outcomes, have been associated with higher risk later in life. These factors are now increasingly recognised in CV and obstetric literature as clinically relevant elements of a woman's long term risk profile.³

Physical activity is another important modifiable factor in female CV health. During pregnancy and postpartum, regular physical activity has been associated with several maternal benefits, including lower risk of GD, hypertensive disorders, caesarean birth, and postpartum depressive (PPD) symptoms in appropriately selected women. Current guidelines advise that women with uncomplicated pregnancies should be participating in at least moderate intensity level of physical activity, with appropriate clinical discretion applied when necessary.⁴

Despite this, reproductive and pregnancy related history is often not documented in a structured manner, especially when the purpose is to understand future cardiovascular risk in relation to lifestyle factors such as physical activity. Questionnaire based approaches for capturing maternal recall of pregnancy complications have been studied in other settings, but there remains a practical need for a simple and contextually relevant tool that can be used in Indian parous women.⁵

Hence, the present study was undertaken to develop a questionnaire to assess pregnancy and gestation-related risk factors for diseases related to cardiovascular health, evaluate its preliminary psychometric properties, and investigate the relationship between these risk markers and physical activity levels among parous females in India.

METHODS

Study design and study setting

An observational study with a cross-sectional design was conducted in gynecology units over an eighteen-month period from June 2022 till November 2023. Study was in compliance with Maharashtra University of Health Sciences (MUHS) declaration and was approved by ethical committee of PES Modern College of Physiotherapy, Pune (Ethical number: EAC010052023007). Ethical standards governing human research kept in mind and followed during entire study.

Study participants

Parous women aged twenty to forty years from Pune, India aged admitted in the Sasoon general hospital, were identified for this study. Postpartum women up to one year after delivery and women who were able to understand English or Marathi were eligible for inclusion. Participants who had not achieved parity, as well as those

with premature menopause, were excluded. The final sample comprised 377 women who were recruited from the study site during the study period.

Development of the questionnaire

The investigators designed the questionnaire based on a review of existing literature on reproductive, obstetric, and selected lifestyle related factors associated with CVD in women. The preliminary questionnaire included sections on demographic details, medical history, family history, gynaecological history, obstetric details, prenatal history, and postnatal history. It included items related to hypertension, diabetes mellitus, hyperthyroidism, cancer, age at menarche, menstrual pattern, dysmenorrhea, PCOS, infertility, endometriosis, use of contraceptives, GD, eclampsia, malposition of placenta, mode of conception, breech presentation, aspirin use during pregnancy, type of delivery, timing of delivery, breastfeeding, and PPD.

Expert review and preliminary psychometric evaluation

Preliminary questionnaire underwent judgement analysis by experts for clarity, relevance, and comprehensiveness. Feedback obtained from expert review was incorporated into the wording and structure of the questionnaire. Following revision, the questionnaire underwent pilot testing in a limited cohort of parous women. Preliminary psychometric evaluation included assessment of internal consistency and structural assessment. Based on this process, items were reworded, merged/removed, and final questionnaire comprised 55 items.

Assessment of physical activity

GPAQ was used to collect participant data. Participants were categorized between 3 categories: active, minimally active, or sedentary on the basis of GPAQ scores.⁶

Data collection procedure

Following informed consent, eligible participants completed a questionnaire developed by the investigators, along with GPAQ. Principal investigator was responsible for data collection, which was subsequently recorded in MS excel 2013 (Microsoft corporation, Redmond, WA, USA) and prepared for statistical evaluation. Final dataset included 377 complete responses.

Statistical data analysis

Data was analysed using Microsoft excel 2013 (Microsoft Corporation, Redmond, WA, USA) and SPSS version 21.0 (IBM Corporation, Armonk, NY, USA). Shapiro-Wilk test was used to assess normality of the variables involved in the dataset. Preliminary psychometric evaluation of the questionnaire included internal consistency and structural assessment. For non-normally distributed variables, Pearson's chi square test was used

to find associations between physical activity categories and study variables. Fisher's exact test was used where Pearson was deemed inapplicable. The strength of relation was checked using Cramér's V. As the confidence interval set at 95%, statistical significance was considered at p value less than 0.05.

RESULTS

Participant characteristics are summarized in Table 1. Mean age was 29.44±3.85 years, mean body mass index was 25.02±2.69 kg/m², and mean waist-hip ratio was 0.89±0.05. Most women belonged to the normal body mass index category, and the majority had medium cardiovascular risk based on waist-hip ratio. The mean physical activity score was 1019.03±756.57 MET min/week. Based on activity classification, 151 of 377 women (40.1%) were sedentary, 122 (32.4%) were minimally active, and 104 (27.6%) were active.

Preliminary psychometric findings are shown in Table 2. The final questionnaire comprised 55 items. Cronbach alpha=0.982, indicating high internal consistency in the available preliminary analysis. Structural assessment showed factor loadings ranging from 0.31-0.54.

Associations between physical activity categories and medical, family history, and gynecological variables are summarized in Table 3. Relatively strong associations were observed for hypertension (Cramér's V=0.421), hyperthyroidism (0.497), dysmenorrhea (0.482), and PCOS (0.414). Moderate associations were seen for diabetes mellitus (0.338), waist-hip-ratio based cardiovascular risk classification (0.226), family history of hypertension (0.255), family history of diabetes mellitus (0.327), family history of cancer (0.327), age at menarche (0.370), and menstrual pattern (0.393). Weaker relationships were reported for cancer (0.156), infertility (0.149), and endometriosis (0.199).

Associations with prenatal and postnatal variables are presented in Table 4. Relatively strong associations were reported for GD (0.548), eclampsia (0.414), type of delivery (0.582), and postpartum depression (0.442). Moderate associations were found for contraception use (0.358), pre-eclampsia (0.347), low-lying placenta (0.289), and week of delivery (0.287). Methods of conception showed a weak association (0.149), whereas breech presentation as well as the aspirin use during pregnancy were not statistically significant in the original analysis.

Table 1: Participant characteristics.

Variables	Value
Age (in years)	29.44±3.85
Body mass index, (kg/m ²)	25.02±2.69
Waist-hip ratio	0.89±0.05
GPAQ score, MET (min/week)	1019.03±756.57
Normal body mass index	222 (58.9)
Medium cardiovascular risk by waist-hip ratio	318 (84.4)
Active	104 (27.6)
Minimally active	122 (32.4)
Sedentary	151 (40.1)

Table 2: Preliminary psychometric properties of the questionnaire.

Property	Result
Final number of items	55
Cronbach alpha	0.982
Range of factor loadings	0.31 to 0.54

Table 3: Associations between physical activity categories and medical, family history, and gynecological variables.

Variables	Cramér's V	P value as reported	Interpretation
Hypertension	0.421	<0.001	Relatively strong
Diabetes mellitus	0.338	<0.001	Moderate
Hyperthyroidism	0.497	<0.001	Relatively strong
Cancer	0.156	0.012	Weak
Waist-hip-ratio based cardiovascular risk	0.226	<0.001	Moderate
Family history of hypertension	0.255	<0.001	Moderate
Family history of diabetes mellitus	0.327	<0.001	Moderate
Family history of cancer	0.327	<0.001	Moderate
Age at menarche (in years)	0.370	<0.001	Moderate
Menstrual pattern	0.393	<0.001	Moderate

Continued.

Variables	Cramér's V	P value as reported	Interpretation
Dysmenorrhea	0.482	<0.001	Relatively strong
PCOS	0.414	<0.001	Relatively strong
Infertility	0.149	0.015	Weak
Endometriosis	0.199	<0.001	Weak

*P values are presented as reported in the original statistical output.

Table 4: Associations between physical activity categories and prenatal and postnatal variables.

Variables	Cramér's V	P value as reported	Interpretation
Contraception use	0.358	<0.001	Moderate
GD	0.548	<0.001	Relatively strong
Pre-eclampsia	0.347	<0.001	Moderate
Eclampsia	0.414	<0.001	Relatively strong
Low-lying placenta	0.289	<0.001	Moderate
Method of conception	0.149	0.011	Weak
Breech presentation	0.067	0.446	Not significant
Aspirin use during pregnancy	0.082	0.258	Not significant
Type of delivery	0.582	<0.001	Relatively strong
Week of delivery	0.287	<0.001	Moderate
Postpartum depression	0.442	<0.001	Relatively strong

*P values are presented as reported in the original statistical output.

DISCUSSION

The present study was undertaken to develop a questionnaire to document reproductive and pregnancy-related risk factors for CVD among Indian parous women and to examine its preliminary psychometric properties in relation to physical activity. The findings demonstrated that the questionnaire had high internal consistency and acceptable preliminary structural assessment. In addition, its cross-sectional application in 377 women showed significant associations between physical activity categories and several reproductive and pregnancy-related variables.

A considerable proportion of the study population was sedentary. Significant associations were observed between physical activity category and hypertension, hyperthyroidism, diabetes mellitus, waist-to-hip ratio based cardiovascular risk classification, dysmenorrhoea, polycystic ovary syndrome, GD, eclampsia, type of delivery, and postpartum depression. These findings are broadly consistent with existing evidence suggesting that reproductive history and adverse pregnancy outcomes may contribute to women's long-term cardiovascular risk profiles.^{3,5-10}

Previous literature has increasingly recognized pregnancy as an important window for future cardiovascular health. O'Kelly et al emphasized the importance of considering cardiovascular health during pregnancy, while Grandi et al and McNestry et al highlighted the long-term cardiovascular implications of pregnancy complications.^{3,7,8} Okoth et al further reported that adverse reproductive and pregnancy-related events may influence the risk of developing non-communicable

diseases later in life.⁹ In the present study, significant associations were observed for GD, eclampsia, week of delivery, and type of delivery across physical activity categories, reinforcing the potential value of systematically documenting reproductive and pregnancy history as part of a comprehensive cardiovascular risk assessment framework for women.

However, the available evidence is not entirely consistent regarding the independent contribution of reproductive and pregnancy-related factors to future CVD risk. An umbrella review by Tugizimana et al reported substantial heterogeneity in the strength and quality of evidence linking various reproductive factors with subsequent CVD, with several associations demonstrating only weak-to-moderate certainty.¹¹ Similarly, earlier literature reviews have reported conflicting findings regarding the relationship between reproductive history and cardiovascular outcomes.

Furthermore, some authors have proposed that adverse pregnancy outcomes may function primarily as markers that unmask an underlying predisposition to cardiometabolic disease rather than acting as direct causal determinants. Hauspurg et al suggested that traditional cardiovascular risk factors, including obesity, hypertension, metabolic dysfunction, and socioeconomic influences, may partially explain these relationships.¹² Sanghavi et al also highlighted the overlap between adverse pregnancy outcomes and conventional cardiovascular risk factors, making it challenging to determine the independent contribution of reproductive variables to future CVD risk.¹³ Therefore, reproductive and pregnancy-related factors should be considered complementary components of cardiovascular risk

assessment rather than substitutes for established cardiovascular risk factors.

These inconsistencies may partly be explained by differences in ethnicity, healthcare access, cultural practices, socioeconomic conditions, and methodological variations across studies. Most available evidence has originated from Western populations, limiting its direct applicability to Indian women. Consequently, there remains a need for population-specific approaches that systematically capture reproductive and pregnancy-related history within the Indian context.

An important strength of the present study was the integration of multiple clinically relevant reproductive, obstetric, and cardiometabolic domains into a single structured questionnaire and its application alongside a standardized physical activity instrument. Structured documentation of these factors may improve consistency in data capture and facilitate future epidemiological investigations, longitudinal studies, and validation efforts. The development of such a context-specific tool may also support the incorporation of women's reproductive health history into broader cardiovascular risk assessment strategies.^{2,9,10}

The present study has several limitations. First, the data were self-reported and are therefore susceptible to recall bias. Second, the cross-sectional design precludes causal inference. Third, physical activity was categorized broadly, and exact p values were not available for all associations in the original statistical output. Finally, the psychometric evaluation remains preliminary and does not establish the questionnaire's wider clinical screening utility or predictive validity.

Future research should include comprehensive psychometric evaluation involving confirmatory factor analysis, test-retest reliability, criterion validity, and responsiveness assessment. Replication in larger and more geographically diverse Indian populations is warranted. Longitudinal studies are also required to determine whether questionnaire-derived reproductive and pregnancy-related information can improve cardiovascular risk stratification and facilitate early identification and follow-up of women at increased cardiovascular risk after pregnancy.

CONCLUSION

The questionnaire showed encouraging preliminary psychometric properties and was feasible for documenting pregnancy and reproductive-related CV risk factors among parous women in India. This screening tool when incorporated into clinical assessment may bridge existing gaps in women's cardiovascular health and guide the development of culturally relevant, evidence-based interventions for long-term disease prevention. However, further psychometric evaluation and validation in larger

and more diverse samples are needed before broader clinical or screening use can be recommended.

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