

## **Maternal Perceptions of Quality of Antenatal Care Services in Sri Lanka: Development and Validation of a Multi-dimensional Instrument**

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### **Abstract**

Maternal perception of antenatal care quality is an important attribute in understanding the relationship between quality and utilization of antenatal care services. However, measuring this in a developing country like Sri Lanka is a significant challenge due to non-availability of valid and reliable instruments. The aim of this study was to develop a valid and reliable instrument to measure maternal perceptions of quality of antenatal care services in Sri Lanka. The main outcome measure was the factor structure and internal consistency of the instrument. We used multiple qualitative methods to generate culturally suitable items for the instrument. It was validated using an exploratory factor analysis methodology among 170 antenatal mothers in 2 Medical Officer of Health areas. Reliability was estimated by measuring internal consistency and test retest method. The four factor model proposed by this paper was able to explain 73% of the total variance of the scale. The Cronbach's alpha value for the total scale was 0.965. Thus, the newly developed 26-item instrument demonstrated satisfactory level of validity and reliability, and it provides useful information that can be utilized by health care providers to identify the areas in antenatal care services that require improvement from a client's perspective.

**Keywords:** client-perceived quality, scale development, exploratory factor analysis, validation, antenatal care quality

### **Introduction**

Quality of care is considered as one of the major public health concerns of this century<sup>1</sup>. Patients' perceptions of the quality of services are widely recognized as a useful tool to improve health services in many developed countries<sup>2</sup>. Such perceptions are considered as one of the best measures of quality in healthcare<sup>2</sup>. Patient perceived quality is defined as subjective and dynamic perception of the extent to which expected health care is received by a person<sup>3,4</sup>. Since patient perceived quality provides an excellent feedback to the healthcare provider, it is of importance to characterize and measure patient perceptions of health care quality to understand more fully what drives those perceptions<sup>5</sup>. This is particularly important for reproductive health care services in developing countries, where advances in the technical quality may be inconsistent with practices passed informally from generation to generation, and where the latter may be perceived by mothers as more important than the former aspect<sup>6</sup>.

In recent decades, much attention has been drawn to antenatal care as a potential intervention to improve both maternal and newborn health<sup>7</sup>. The antenatal period presents important opportunities for reaching pregnant women with number of interventions that may be vital to their health and well-being, and that of their infants<sup>8,9</sup>. Antenatal care is a critical area where quality can play a major role in ensuring the wellbeing of the mother (and the child)<sup>9</sup> and the maternal perception of quality of services is considered as a factor which has a greater influence on mothers' behaviours when

compared to access and cost<sup>10</sup>. Since the perceived quality invariably affect mothers' behaviour, a mother may choose not to return for antenatal care services which in turn may result in adverse outcomes to the mother (and child)<sup>6</sup> and also results in poor utilization of antenatal care services<sup>11,12</sup>. This gives a necessity for greater recognition of the need to understand perceptions of quality from the perspective of mothers who are users of the antenatal care services. The aim of this study is to develop an instrument to assess maternal perceptions of quality of antenatal care services and validate the instrument for use in Sri Lanka.

## **Materials and Methods**

Various methodologies<sup>13-15</sup> have been described in the literature for developing instruments to measure abstract constructs such as maternal perceptions of antenatal care quality (client-perceived quality). We adopted a method proposed by DeVellis<sup>13</sup> which essentially consist of same core contents similar to other authors<sup>14,15</sup>. This method includes the following steps: defining the concept, generation of an item pool, determining the format for measurement, validation of the instrument, assessment of reliability of the instrument, and factor analysis to evaluate the items to decide on an optimal scale length. The last three steps are essentially inter-related.

### **Defining the concept**

Based on the existing literature we conducted an extensive literature search for most common and widely quoted definitions of client-perceived quality, and antenatal care<sup>4,16,17</sup>. These definitions were later narrowed down focusing on theory and specificity of the concepts. A set of themes were generated from in-depth interviews, key informant interviews and focus group discussions based on above definitions of key concepts.

### **Qualitative data collection**

Similar to many developing countries in the region, Sri Lanka is also divided into number of Medical Officer of Health (MOH) areas. The MOH areas are health administrative areas where a Medical Officer is in charge of preventive health services including maternal and child health. The MOH has a staff of one or more Public Health Nursing Sister and number of Public Health Midwives, providing clinic based and domiciliary antenatal care services. We conducted 15 in-depth interviews and 2 focus group discussions among antenatal mothers of two of these MOH areas. The two MOH areas were selected from Colombo district due to reasons related to feasibility. The Key informants included Medical Officers, Public Health Nursing Sisters, Public Health Midwives, Health volunteers, and Women and Child Welfare officers from a Local authority. Purposive sampling method was used to identify the participants since our objective was to discover diversity of opinion. One of the authors (SDW) of the study recruited participants from antenatal clinics (setting) in the 2 MOH areas. We utilized interview protocols and guides to ensure consistency between interviews and to increase the reliability of the findings. SDW conducted all interviews and was the moderator for two focus group discussions. Content analysis methodology was used for theme generation<sup>18,19</sup>. Four main themes were generated from the qualitative data analysis.

### **Item generation and format of measurement**

We generated a pool of items from above identified main themes. Both positively and negatively worded items were generated, and they were worded in a way that each item to express only one idea. Colloquialisms, expressions and technical jargon were omitted from the items. Evaluative Likert scale was used as the format of measurement since it is considered as the most widely used format for measuring opinions, beliefs and attitudes<sup>13</sup>. The final instrument consisted of 36 items. The instrument was designed to be self-administered with all the necessary instructions. It had a positive scoring system from +1 to +5 for each item.

**Validation of the instrument**

Validity of the instrument was assessed based on the concepts of face, content and construct validity. Since maternal perceptions of antenatal care quality is an abstract construct the main type of evidence used to indicate construct validity in this type of a tool is correlation evidence in the form of factor analysis<sup>13-15,20,21</sup>. The face validity of the instrument was assessed by ratings of five antenatal mothers who were asked about the acceptability of the instrument<sup>22,23</sup>. Content validity was assessed by a panel of five content experts in the field of Maternal and Child Health. The items were assessed for their relevance, representativeness, specificity and clarity. Each category was assessed on a 5 point evaluative scale<sup>24,25</sup>. The original tool consisted of 36 items. This was reduced to 34 items after evaluating for the content validity. Exploratory factor analysis (EFA) methodology was used to assess the construct validity of the instrument<sup>13,15,20</sup>.

**Study population and sample size for validation study**

The study population for the validation study was antenatal mothers with period of amenorrhoea  $\geq 36$  selected from 2 MOH areas. Antenatal mothers who have been diagnosed with psychiatric conditions, those who are unable to communicate and the mothers who have been included in the qualitative data collection were excluded. The literature on factor analysis methods mentions different recommendations regarding sample size for factor analysis. These are stated in terms of minimum sample size or minimum ratio of subjects per variable<sup>26</sup>. They include many rules of thumb such as minimum sample size of -  $N \geq 100$  to 200, minimum number of cases per each parameter (at least 5 to 10 cases per parameter) and methods including Satorra-Saris approach and Monte Carlo methods<sup>26-28</sup>. We used five subjects per variable (5:1) which was well above the lowest requirement mentioned by many different methods. Consecutive sample of 170 mothers were selected within a period of two months attending all antenatal clinics in the selected two MOH areas. Two field investigators were used to collect data for the validation study. The two investigators were GCE A/L qualified with over 12 years of schooling, which is the university entrance exam in Sri Lanka.

**Reliability of the instrument**

The internal consistency and test retest method was used to measure the reliability of the instrument. Internal consistency was assessed by calculating Cronbach's alpha<sup>29</sup>.

**Statistical Analysis**

Prior to assessing factorial validity the appropriateness of data for the EFA was assessed using several parameters<sup>14,15</sup>. This was done by observing the inter-item correlation matrix, anti-image correlation matrix and measures of sampling adequacy. In the inter-item correlation matrix (correlation matrix) there were several sizable correlations more than 0.5 (as required). All the diagonals of the anti-image correlation matrix were above 0.5. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.917 and it was well above the required value of 0.5. The Bartlett's Test of Sphericity value obtained was significant (as required). The missing values were handled using list wise deletion method. Univariate normality of the variables was assessed by inspection of all item histograms<sup>30</sup>. Standardized skewness and kurtosis scores were also calculated for the items. Standardized skewness and kurtosis values for 34 items were within the acceptable range of  $< \pm 2$  which was found to be satisfactory according to criteria stated by Muthen and Kaplan<sup>30</sup>. The data was analysed using SPSS version 16.0.

**Ethics**

The study was approved by the University of Colombo Research Ethics Committee, Sri Lanka (EC/10/095).

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## Results

There were four main themes derived from in-depth interviews, key informant interviews and focus group discussions. The first theme focuses on 'practices and conduct' of the antenatal staff. The second theme is about the 'provision of services' in the antenatal clinics. The third theme focuses on 'resource' and, the final theme concerns about 'accessibility'. Practices and conduct theme had 7 sub-categories (amount of information given to mothers, respect for mothers, reception of mothers, support for mothers, allowing sufficient time for mothers, compassion for mothers, good clinical examination and follow-up). Resources theme consisted of 4 sub-categories (space in the clinic, availability of drugs, adequacy of doctors and staff, equipments). Provision of services theme also had 4 sub-categories (good diagnosis, quality of drugs, recovery from illness, prescription of drugs by doctors). Accessibility theme only had 3 sub-categories (distance, cost, ease of obtaining drugs). Analysis of qualitative data of this study is discussed in detail elsewhere<sup>31</sup>.

Data from all antenatal mothers (n=170) of the validation study was analysed, and there were no non-respondents. Majority of the mothers were 20 – 29 years of age (n=98, 57.6%), with 5.9% (n=10) and 15.3% (n=26) being < 20 years of age and > 34 years of age respectively. About 78% (n=133) of the mothers had an education level of G.C.E O/L or more with 68% (n=116) reporting a monthly income of SLR 15,000 or more. The percentage of Sinhalese mothers in the sample was 81.8% (n=139). The validity and reliability data of the instrument is described below with the values obtained for each domain.

The four domains we obtained from the results of the factor analysis explained 73 per cent of the total variance of the maternal perceptions of antenatal care quality scale. These domains were named by analyzing the items included in each domain. Content experts in Maternal and Child Health were used as judges in deciding the names for domains. The first domain was named as 'technical expertise and medication', second as 'resources and accessibility', third as 'interpersonal care and information', and the last domain as 'communication, clinic and home visits'. The first domain consisted of 6 items and the other three domains consisted of 4, 8 and 8 items respectively.

With reference to variance the first factor accounted for 53.6 per cent of the variance with other three factors accounting for 8.2 per cent, 6.2 per cent and 5 per cent respectively. This result was achieved by using principal axis factor extraction method for the analysis. According to Kaisers' criteria, six factors had the Eigen values over 1. However, the scree plot analysis suggested a four factor solution which seemed to be more appropriate. Hence, the four factor solution/four domain structure was adopted<sup>30</sup>. Since the factors are expected to have some degree of correlation according to the construct definition, the oblique rotation method was selected. The table 1 shows the factor correlation matrix which also signifies a moderate degree of correlation between factors. Most authors recommend using this method when there is some degree of correlation between factors<sup>30,32</sup>. The final factor loadings for each subscale are given in table 2. Most items in each domain had satisfactory factor loadings of above 0.6. All four domains had more than one item with sizable factor loadings with a congruent factor structure.

The Cronbach's alpha value for the total scale was 0.965. The Cronbach's alpha values calculated for each subscale are given in table 3. The reliability scores of the total instrument and the subscales were highly acceptable. The appropriateness of calculating the test-retest reliability for client perceived quality of care was not discussed in many publications. However according to Taylor<sup>33</sup> perceived service quality can be considered as a comparatively long term attitude. Based on this assumption, test-retest reliability was calculated for the instrument and the Pearson's product moment correlation coefficient for the total score was found to be 0.979 which indicated the excellent temporal stability of the construct as well as the good reliability of the instrument<sup>13</sup>.

## Discussion

The instrument we developed to measure maternal perceptions of quality of antenatal care in this study demonstrated a satisfactory level of validity and reliability. The maternal perceptions of quality of antenatal care can be considered as a multidimensional concept. This has been shown by various other studies in different settings in different countries<sup>3,34-36</sup>. Although the number of domains and their naming in these studies are different, there are essential similarities in the items of core dimensions. Nevertheless, apart from the cultural differences there are other aspects that have to be borne in mind such as the subjects, setting and the health system before comparing the dimensions described by each study. In the context of Sri Lankan antenatal care services, the clinics at MOH offices are conducted by MBBS qualified Medical Officers with all the ancillary staff. They are fully equipped to provide optimal antenatal care for the mothers. The range of services they provided includes registration of the mother, screening for maternal risk factors, ongoing assessment of maternal and foetal wellbeing and, health promotion. The public health midwives attached to these MOH offices provide clinic based and domiciliary services to all antenatal mothers in the MOH area. The items of the instrument we used in this study were developed to capture all these aspects of antenatal care.

The reliability of the instrument was found to be lowest for the 'resources and accessibility' domain (0.88). This was not a surprising finding since this domain was more physical in nature. This was in agreement with the findings reported for conceptually similar domains in other instruments of this nature- 'health facility domain' (0.71)<sup>34</sup>, 'access to services domain' (0.33)<sup>3</sup>, 'financial and physical access to care domain' (0.7)<sup>36</sup>. Most of the generated items in this instrument were specific to one domain. However some items correlated with more than one domain and some items appeared to be suitable for more than one domain. This was mostly due to nature of the underlying attribute which was related to more than one factor<sup>34</sup>. However, eight cross loading items were dropped to retain a stable factor structure in our study.

One of the key strengths of this study in relation to tool development was that it utilized three qualitative data collection methods (in-depth interviews, key informant interviews and focus group discussions) for item generation. This had the advantage of triangulation<sup>37</sup> of themes in generating more accurate items<sup>37,38</sup>. Similar methodologies were adopted by other authors in developing client perceived quality of care instruments<sup>3,34</sup>. These three types of qualitative method have been previously demonstrated to be quite valid in number of qualitative studies conducted in Sri Lanka with contrast to methods such as observations, or analyzing texts/documents<sup>39,40</sup>. The content validity of the scale of this study was maximized by use of a quantitative method for content validation with a 5 point evaluative scale, which is considered as a more objective method of content validation<sup>24</sup>. Criterion validity was not assessed since there were no known gold-standards for client-perceived quality of care<sup>20</sup>. Factor analysis was used instead in our study as the method of choice to establish construct validity, since this was the commonest recommended method stated by many authors to assess construct validity of an instrument<sup>3,13-15,20,35</sup>. Although the factor extraction method discussed in this paper was limited to principal axis factoring other methods of extraction were also tested by the authors for suitability. The number of factors to be retained was an important issue since Kaisers' criteria was more in favour of a six factors solution while scree plot analysis was in favour of a four factor solution. Since most authors were in favour of scree plot analysis over the over-factoring Kaisers' criteria<sup>30,41</sup>, four factors were retained. Though there were numerous custom made statistical software to decide on the number of factors (using techniques such as Velicer's MAP test and Horn's Parallel Analysis<sup>41</sup>) they were avoided since there was no universal agreement among authors. A primary concern faced by many authors in developing new instruments is the social desirability bias (tendency to respond to items in a social desirable manner) and acquiescence bias (tendency to agree with all items regardless of the content). When developing items for the instrument we took meticulous care to minimize these biases upfront, nevertheless complete elimination of

these biases were not feasible<sup>13,14</sup>. Our aim of this study was limited to validate the newly developed instruments psychometric properties (construct validity and reliability), however validation can be thought as an ongoing process and use of this instrument in a large sample by conducting a confirmatory factor analysis would be helpful in refining the identified domains furthermore.

## Conclusion

The instrument we developed for assessing maternal perception of quality of antenatal care enabled identification of domains and the items relevant to the desired concept. The psychometric properties of this instrument were found to be satisfactory. Thus, we believe the contents of this study instruments provide useful information that can be used for improvement of quality of antenatal care from a client's perspective.

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**Table 1** –Factor correlation matrix of the maternal perceptions of antenatal care quality scale

Factor	TE&M	R&A	IPC&I	CC&H
TE&M	1.000	0.603	0.656	0.542
R&A	0.603	1.000	0.656	0.456
IPC&I	0.656	0.656	1.000	0.481
CC&H	0.542	0.456	0.481	1.000

Note: TE&M - Technical expertise and medication, R&A - Resources and accessibility, IPC&I - Interpersonal care and information, CC&H - Communication, clinic and home visits

**Table 2** - Factor loadings of subscales of the maternal perceptions of antenatal care quality scale

Factor/ item	Factor loading
<b>Technical expertise and medication</b>	
1. Examination by the doctors	0.884
2. Referrals to hospitals	0.944
3. Monitoring recovery from illness	0.915
4. The way drugs were prescribed	0.905
5. The ability to obtain drugs	0.873
6. Quality of drugs	0.761
<b>Resources and accessibility</b>	
7. Adequacy of doctors	0.660
8. Adequacy of public health midwives	0.852
9. Cost	0.710
10. Distance	0.608
<b>Interpersonal care and information</b>	
11. Compassion	0.786
12. Support	0.893
13. Respect	0.919
14. Reception of mothers	0.971
15. Honesty of health staff	0.947
16. Follow up of mothers	0.829
17. General information	0.655
18. Information provided about specific health problems	0.577
<b>Communication, clinic and home visits</b>	
19. Willingness of the doctors to discuss problems	0.536
20. Explaining the purpose of diagnostic tests	0.605
21. Politeness of doctors	0.744
22. Number of home visits	0.927
23. Time spent during a home visit	0.920
24. Adequacy of toilet facilities in the clinic	0.825
25. Waiting time in the clinic	0.800
26. Privacy in the clinic	0.678

**Table 3** – Cronbach's alpha values for four subscales

Subscale	Cronbach's alpha
1. Technical expertise and medication	0.958
2. Resources and accessibility	0.883
3. Interpersonal care and information	0.953
4. Communication, clinic and home visits	0.935

**Annexure 1**

English translations of the maternal perceptions of quality of antenatal care instrument validated to Sri Lanka.

<b>Maternal perceptions of quality of antenatal care instrument</b>						
<p>The following questions concern about the current antenatal care that you are receiving. It concentrates mainly on the routine antenatal clinic you are visiting in this pregnancy. The questions ask about your personal perceptions, so there is no right or wrong answers. For each question please indicate your opinion by marking an 'X' mark. i.e- If you find your opinion to a question very unfavourable, mark an 'X' in the left corner box (1). If you find your opinion very favourable, mark an 'X' in the right corner box (5). If you think the answer is neither favourable nor unfavourable mark an 'X' in the neutral box (3). You can mark unfavourable and favourable opinions in-between similarly.</p>						
No	Item	1	2	3	4	5
		very unfavourable	unfavourable	neutral	favourable	very favourable
1.	In your opinion, the way doctors in your antenatal clinic examine you is,					
2.	In your opinion, the way the mothers are referred to hospital from the clinic for identified illness,					
3.	The quality of drugs given from your antenatal clinic is,					
4.	In your opinion, the ability to obtain drugs from the clinic in every month,					
5.	In your opinion, the way drugs prescribed from your antenatal clinic is,					
6.	In your opinion, the way doctors monitor recovering from illness in your antenatal clinic is,					
7.	The adequacy of doctors in your antenatal clinic is,					
8.	The adequacy of public health midwives in your antenatal clinic is,					
9.	In your opinion, The cost you bear coming to your antenatal clinic is,					
10.	In your opinion, The distance to this clinic from your home is,					
11.	In your opinion, the compassion shown by the health staff to mothers in your antenatal clinic is,					
12.	In your opinion, the support shown by health staff to mothers in your antenatal clinic is,					
13.	In your opinion, the respect shown by the health staff to mothers in the your antenatal clinic is,					
14.	In your opinion, the reception of mothers in your antenatal clinic is,					
15.	Your opinion about the honesty of health staff in your antenatal clinic is,					
16.	In your opinion, the follow up of mothers by the doctors in your antenatal clinic is,					
17.	The general information provided to mothers in your antenatal clinic is,					
18.	The information provided about specific health problems in your antenatal clinic is,					
19.	In your opinion, the willingness of the doctors in the clinic to discuss any questions you have is,					
20.	Your opinion about the way doctors explained the purpose of the diagnostic tests in your clinic is,					
21.	The adequacy of toilet facilities in your antenatal clinic is,					
22.	In your opinion, the number of home visits by the midwives in your area are,					
23.	In your opinion, the time midwives spent for you during their home visits is,					
24.	Your opinion about the politeness of the doctors in your antenatal clinic is,					
25.	In your opinion, the waiting time of the clinic till a doctor sees you is,					
26.	In your opinion, the way your privacy was respected by the health staff in your antenatal clinic is,					