

Original Research Article

Design and Validation of a Scale to Measure Attitudes towards Abortion Legislation; Application of Explanatory and Confirmatory Factor Analysis

Abstract

General societal attitudes on induced abortion can influence the health sector policy response towards providing safe abortion services. This study aimed to develop a scale and evaluate the validity and reliability to measure public attitudes towards abortion legislation. An scale was developed by adapting existing scales and finalized with experts' opinions. An interview schedule was administered among 728 adults residents in Colombo, Sri Lanka. **Validity** and reliability were tested after performing Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

The finalized scale contained 8 items and 2 factors named "Attitudes towards soft reasons" and "Attitudes towards hard reasons". The two factors explained 71% of the total variability. The CFA showed a good model fit. Composite Reliability for the first and second factors were 0.938 and 0.890 respectively. The scale's internal consistency correlation coefficient was at the acceptable level (Cronbach's alpha = 0.923 and 0.850, McDonald's omega = 0.915 and 0.863 for the first and second factors respectively). The Average Variance Extracted of the two factors were 0.792 and 0.671 whereas the Maximum Shared Squared Variance was 0.054. The correlation between the two factors was 0.23.

The scale is proved to have high validity and reliability to measure the public attitudes towards abortion legislation.

Key Words:- Abortion attitude scale, Explanatory and Confirmatory Factor Analysis, Validity, Reliability, Psychometric Analysis.

Introduction

Unsafe abortion is the termination of an unintended or unplanned pregnancy either by a person lacking the necessary skills or in an environment lacking minimal medical standards or both (WHO, 2007). Whereas an illegal abortion is defined as an induced abortion performed outside the laws regulating abortion in that country (Mosby's Medical Dictionary, 2009). Assuming that all legal abortions performed under a safe environment by a skilled person are safe abortions, all illegal abortions presumably not done under similar conditions need to be considered as unsafe (1). The conditions under which abortion is legally permitted vary from country to country. In some countries, access to abortion services is highly restricted whereas in other countries, induced abortion is available on broad medical and social grounds or on request (2). As per the World Health Organization, in all most all the countries (98%) in the world, abortion is allowed to save a woman's life; however, only in one fourth of the countries (28%), abortion is available on request (3).

Abortion has always been a controversial subject in many societies including western world where more liberalized abortion policies are available. While a significant portion of people believe that it is a woman's right to decide whether or not to have an abortion, others believe that having an abortion is wrong based on religious, political, emotional, and personal morals. It all comes down to various upbringings, ethics, religious backgrounds, political alignments, and other attributes that play into forming opinions (4). Attitudes of the general public towards induced abortion can influence both the decision-making process of the individuals after they face with an unwanted pregnancies, and also the health sector policy response towards providing safe abortion services (5; 6; 7). Therefore, developing a simple, valid and reliable tool to measure public attitudes towards legislation is of utmost importance for countries in which abortion laws are restricted but seeking possible legislative changes.

Most of the tools currently available are aimed to measure general attitudes towards abortion but not specific enough to measure the attitudes towards legislative changes (8; 9; 10; 11). Also most of those tools have been tested and validated in countries where abortion is not restricted (8; 9; 8; 11; 12; 13; 14; 15; 16). It is important to note that in identifying the latent variable/s which the scale is supposed to measure (called the factor structure) is important in any scale. The factor structure/model of most of the available tools has not been identified (10; 12; 15; 16). We also

identified that most past studies suffer from inadequate sample size or lack of representativeness of the general public (10; 11; 12; 13; 17; 18; 19). Therefore, this study aims to develop a scale and factor structure to measure public attitudes towards the possible legislative changes in the countries where abortion laws are restrictive and to evaluate the validity and reliability of the scale with a representative sample.

The current study was conducted in Colombo, Sri Lanka, where induced abortion is highly restricted. Under the penal code of Sri Lanka (1883 section 303), abortion is a criminal offence except when performed to save the mother's life (20). According to section 304, in case of the death of a women after undergoing an illegal abortion, the person who performed the abortion outside the law shall be punished with imprisonment up to 20 years (21). Several attempts were made in the past (1970, 1995 and 2018) to amend the Sri Lankan abortion law to allow legal abortion for rape and incest with the leadership of the Sri Lanka College of Obstetricians and Gynecologists (SLCOG). The amendment was developed and much debated among all concerned parties. However, this did not materialize due to social and cultural concerns (2).

Methodology

This study was conducted in two phases; (1) Development of an attitude scale to measure abortion attitudes, (2) validation of the scale. Literature reviews, Collection of expert opinions/feedback and interviews were conducted in the first phase. Then the scale was validated by implementing psychometric assessment measures.

Scale Development

The study started with a strong literature review to identify the available scales and tools to measure attitudes towards abortion legislation. After carefully evaluating related articles, 18 items which measure abortion attitudes in five-points Likert Scale were identified at the initial stage. The items were presented to a group of experts with experience in researching the field of Sexual and Reproductive Health. The group comprised 12 experts in the fields of Community Medicine, Obstetrician and Gynecology, Public Health, Sociology, Demography and

Communication. The experts were requested to evaluate the questionnaire items for content validity and applicability in the Sri Lankan context. The expert opinions were collected qualitatively through face to face interviews or online interviews. Apart from evaluating content validity, experts were requested to suggest amendments to the items, including re-wording, additions and deletions. Based on the expert opinions, the number of items was reduced to 10 and re-worded where necessary to make the scale gender and age neutral.

The questionnaire which includes these 10 closed ended Likert scale type questions and was developed initially in English and translated into Sinhala and Tamil(local languages). The questionnaire was administered among 15 randomly selected individuals. Necessary revisions were incorporated based on the findings from the pilot test. Ethical clearance to conduct this study was received from the Ethical Review Committee of the Sri Lanka Medical Association (SLMA-ERC).

Study Population and Sampling

The study population for this research included all the adults (both males and females), aged 19 to 49 who have lived in Colombo City for at least 12 months. The Colombo city was selected for the study, as the highest rate of abortion in Sri Lanka is estimated in Colombo city (22) and it represents a fair distribution of all ethnic groups (23). The study was conducted at the Thimbrigasyaya Divisional Secretariat Division (TDSD), one out of two DSD's in the Colombo city. The 20 Grama Niladhari Divisions (GND) of the TDSD were divided into two strata considering the percentage of households (HH) with toilet facilities within the same HH unit (23). The first stratum contained 10 GNDs which reported more than 80 percent of HHs with toilet facilities exclusively for the HH whereas the second stratum contained 10 GNDs which reported less than 80 percent of households with toilet facilities. Three GNDs were selected from each stratum using systematic probability proportional to the size (PPS) cluster selection method. Total of 6 GNDs were selected for the study. The selected GNDs were divided into housing clusters using the housing data available in the 2012 report published by the department of election, Sri Lanka. Five to eight housing clusters and 50 HHs were selected from each GND using a systematic procedure. i.e. every their HH were selected starting from a random point until the sample size is achieved. The sample size for the HH study was 300 HHs which was

calculated applying a standard sample size calculation formula for HH surveys (24). The sample size was calculated at 95 percent confidence interval assuming 0.64 expected proportion of residents between the ages of 19-49 from the total population (P) and 10 percent precision (margin of error = 0.06). (23).

Data Collection

All the eligible residents in the HH were interviewed after receiving their written informed consent. Maximum two visits were conducted to each HH to capture all the eligible participants. A structured questionnaire that included newly developed abortion attitude scale was administered by a team of trained interviewers, recruited from the department of Sociology, University of Colombo. Data collection was conducted from each respondent separately in a confidential environment ensuring the privacy of the respondents. . A show card containing scale items was used to support the respondents. Of the total of 1022 eligible individuals resident in the 271 selected households, only 825 (80.72 %) were available and agreed for the interview. Of those, a total of 743 responses (90.06 %) were received. Remained 29 HH had not eligible individuals. After data clearing, only 728 respondents had provided valid responses to the questions on abortion attitude.

Data Analysis

Descriptive statistics, Explanatory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and hypothesis were performed to measure the validity and reliability of the newly developed the abortion scale. Data analysis was conducted using the Microsoft Excel application and Statistical Package for Social Sciences (SPSS-v26). CFA was performed using Analysis of Moment Structure software (AMOS-v26). As per the standard scale validation methodology, a final sample with 728 valid responses was randomly divided into two equal groups using the random case selection option available in SPSS (25). First group (n=364) was used for EFA and the second group was used for CFA.

Explanatory Factor Analysis

EFA was performed through Principle Component factor extraction method and Varimax rotation. The Kaiser-Meyer-Olkin (KMO) index was used to determine the sampling adequacy to perform the factor analysis. Whereas the Bartlett's sphericity test was used to assess whether the data was free of single response bias (25). A KMO of higher than 0.9 was preferred whereas a value greater than 0.7 was considered adequate (25; 26). The factor extraction was based on the scree plots and some widely accepted criteria in EFA (absolute factor loading value > 0.5 , communalities > 0.2 , eigenvalues > 1). The KMO test was evaluated for each variable using the matrix of anti-image correlations main diagonal values. Values equal to or above 0.5 (or 50 per cent) were considered adequate (25). EFA was performed for the original scale (with 10 items) initially. All the above criteria was satisfied. The factor structure resulted from the EFA was used as inputs for CFA. The final scale after fitting the CFA factor model had only 8 items. The EFA was performed again for the final model (with 08 items).

Confirmatory Factor Analysis

The factor structure obtained from the EFA was considered as the input for CFA to confirm the factor model. Two items that generated a standardized residual covariance of more than 4.000 were removed from the scale at the first stage before proceed with further analysis . The resulted factor model had only 8 items. All the scale items resulted a coefficient of correlation higher than 0.5 (26). The Chi-square statistic, Parsimonious Comparative Fit Index (PCFI), , Parsimonious Normed Fit Index (PNFI), Minimum Discrepancy Function divided by Degrees of Freedom (CMIN/DF), Comparative Fit Index (CFI), Tucker–Lewis index (TLI), Incremental Fit Index (IFI), , and Root Mean Square Error of Approximation (RMSEA) were used as model fit indices (27; 28).

Assessment of Validity and Reliability

The content validity of the scale was established with expert opinions in the initial stage of the study. EFA and CFA were used to assess the construct validity. The convergent and divergent

validity of the proposed scale was assessed on the Fornell criteria (29). Average Variance Extracted (AVE), Composite Reliability (CR) and Maximum Shared Squared Variance (MSV), measures were used in the status (Table 01). In order to establish the convergent validity, AVE must be greater than 0.5 and CR must be higher than AVE. Higher values of AVE compared to MSV proved divergent validity (30).

Table 01:- Validity and reliability measures used in the study.

Measurement	Description
01 Average Variance Extracted (AVE)	Measure of the amount of variance that is captured by a construct in relation to the amount of variance due to measurement error (31).
02 Maximum Shared Squared Variance (MSV)	The squared inter-construct correlation which is a measure of correlation between two constructs or factors (32).
03 Composite Reliability (CR)	Composite reliability is a measure of internal consistency in scale items. It can be thought of as being equal to the total amount of true score variance relative to the total scale score variance (33; 34).
04 Cronbach's alpha (α)	Measure of the internal consistency of a scale describes the extent to which all the items in a scale measure the same concept or construct. It is connected to the inter-relatedness of the items within the scale (35; 36).
05 McDonald's omega (Ω)	Coefficient McDonald's omega (1999) which is known as greatest lower bound reliability is a similar measure to Cronbach's alpha. Advantage of Ω over α is that it can be used when the items have unequal covariance with the true score (37).
06 Average Inter-item Correlation (AIC)	Average inter-item correlation is a way of analyzing internal consistency reliability. It is a measure of if individual questions on a test or questionnaire give consistent, appropriate results; different items that are meant to measure the same general construct or idea are checked to see if they give similar scores (38).

The reliability of the newly developed scale was evaluated by testing the internal consistency using Average Inter-item Correlation (AIC), Cronbach's alpha and McDonald's omega.

McDonald's omega was estimated using SPSS macro utility developed by Hayes (39). Values greater than 0.7 for Cronbach's alpha and McDonald's omega were considered acceptable whereas for AIC, the ideal value is 0.2–0.4 (40). However, AIC between 0.15 and 0.5 is acceptable (38). CR value greater than 0.7 was regarded as desirable reliability (41). Table 01 describe the validity reliability measures used in the study.

Limitations of the study

The proposed scale was developed to measure the attitudes of general public towards abortion legislation. More researches are needed to assess its' applicability to measure the abortion attitudes in general. Further, this study was carried out in Sri Lanka, in a country where the abortion law is highly restricted. Further studies are needed to assess its' applicability in countries with liberal abortion laws. The field testing of the newly developed attitude scale was conducted in Colombo city which has a fair representation of all the ethnic groups, religious groups and social classes including urban slum areas. However, the rural and estate sectors of Sri Lanka was not included in the study.

Results

After completion of data cleaning, 728 valid responses were received which were divided into two subsamples to perform EFA and CFA. The average age of the respondents was 33 years (SD = 11.15) and consisted of 293 (40%) males and 432 (60%) females. Table 02 describes the socio-demographic characteristics of the sample. Table 02 describes the sample characteristics. .

Table 02:- Sample characteristics disaggregated by sub-samples; EFA and CFA (n=728)

Socio-Demographic Characteristic	Category	CFA		EFA		Total Sample	
		#	%	#	%	#	%
Sex	Female	230	63%	202	56%	432	60%
	Male	133	37%	160	44%	293	40%
Age	Below 25	135	37%	129	35%	264	36%
	25 and Above	229	63%	235	65%	464	64%
Ethnicity	Sinhalese	193	53%	183	50%	376	52%
	Muslim	69	19%	61	17%	130	18%
	Indian Tamil	7	2%	9	2%	16	2%
	Sri Lankan Tamil	93	26%	107	29%	200	27%
	Burgher	2	1%	4	1%	6	1%
Religion	Buddhist	158	43%	152	42%	310	43%
	Islam	69	19%	65	18%	134	18%
	Hindu	73	20%	87	24%	160	22%
	Roman Catholic	29	8%	20	5%	49	7%
	Christian	35	10%	40	11%	75	10%
Marital Status	Married	187	52%	200	55%	387	53%
	Never Married	160	44%	152	42%	312	43%
	Divorced	3	1%	4	1%	7	1%
	Widow	12	3%	8	2%	20	3%

Note:- # = Number of Respondents, % = Percentage of Respondents

After establishing the content validity, 10-item scale was proceed with the construct validity step. The KMO test statistic was 0.781 whereas the Bartlett's test value was 2,958.57 ($P < 0.000$) which confirmed that EFA can be performed. Two factors were extracted using Principle Component factor extraction method and rotated using Varimax rotation. The first two factors explained 71% of the total variance. The two factors were named as "attitudes towards soft

reasons” (4 items) and “attitudes towards hard reasons (6 items)” (Table 03). Community as well as the diagonal values of the matrix of anti-image correlations for all the items was greater than 0.5 indicating a satisfactory factor model.

Table 03:- Community and factor loadings of initial and final two factor model (n=364)

Item	Initial Model		Finalized Model			
	Com	Loadings		Com	Loadings	
		F ₂ (Hard)	F ₁ (Soft)		F ₂ (Hard)	F ₁ (Soft)
1 The Government of Sri Lanka must not legalize abortion under any circumstances.	0.6140	0.7832				
2 The Government of Sri Lanka must legalize abortion to save the mothers’ life	0.6645	0.8152	0.5798	0.7613		
3 The Government of Sri Lanka must legalize abortion to terminate a pregnancy resulting from rape	0.7360	0.8501	0.8278	0.9062		
4 The Government of Sri Lanka must legalize abortion to terminate a pregnancy resulting from incest	0.7163	0.8092	0.8043	0.8758		
5 The Government of Sri Lanka must legalize abortion to terminate a pregnancy with fetal abnormalities – lethal conditions of the fetus	0.6380	0.6990	0.6201	0.7183		
6 The Government of Sri Lanka must legalize abortion to terminate a pregnancy with fetal abnormalities – fetus may survive with major abnormal conditions	0.5213	0.5295				
7 The Government of Sri Lanka must legalize abortion to terminate a pregnancy resulting from a contraceptive failure.	0.7417	0.8516	0.7535	0.8561		
8 The Government of Sri Lanka must legalize abortion to terminate a pregnancy on account of bad economic conditions of the parents.	0.7551	0.8602	0.7798	0.8711		
9 The Government of Sri Lanka must legalize abortion on the request of the couple.	0.8376	0.9098	0.8526	0.9133		
10 The Government of Sri Lanka must legalize abortion on the request of the mother	0.8437	0.9126	0.8602	0.9171		

Note: - Com=Community, Loadings=Factor loadings after Varimax rotation, F1=Factor one (Attitudes towards soft reasons), F2=Factor two (Attitudes towards hard reasons)

In the CFA, item 1 and item 6 shows high values (greater than 4.000) for standardized residual correlation and resulted in lack of overall model fit. Therefore, those two items were removed from the scale. It is noteworthy that those two items resulted in lowest community values in the initial EFA too. After certain modifications, the finalized model with 8 items shows an overall good model fit (Table 04). The path diagram of the final CFA model is presented in figure 01.

Table 04:- Model fitting measure and criteria of the final CFA model with 8 items (n=364)

Indices	Result	Model fit criteria
Degrees of Freedom (DF)	16	
chi-square (χ^2) statistic	37.929	Lower the χ^2 , better the model fit (28).
P-Value	0.002	Assuming that the Default model is correct, the probability of getting a discrepancy as large as 37.929 is .000.
Minimum Discrepancy Function divided by Degrees of Freedom (CMIN/DF)	2.371	If CMIN/DF is less than 5 indicate good absolute model fit (28).
Root Mean Square Error of Approximation (RMSEA)	0.061	RMSEA less than 0.06 indicate good absolute model fit. Up to 0.08 acceptable (28).
Parsimonious Normed Fit Index (PNFI)	0.562	Higher the value, better the model. PNFI greater than 0.5 indicate good parsimonious model fit (28).
Parsimonious Comparative Fit Index (PCFI)	0.566	Higher the value, better the model. PCFI greater than 0.5 indicate good parsimonious model fit (28).
Tuker-Lewis Index (TLI)	0.984	TLI greater than 0.90 indicate good incremental model fit (42; 41).
Incremental Fit Index (IFI)	0.991	IFI greater than 0.90 indicate good incremental model fit (42; 41).
Comparative Fit Index (CFI)	0.991	CFI greater than 0.95 indicate good incremental model fit (28).

AVE, MSV and CR confirmed the convergent validity and discriminant validity (Table 04). The MSV of the two factors was less than AVE and the correlation between two factor was very low (0.23). This results confirmed that the extracted factors are separated from each other therefore the second-order CFA is not required. The results of the McDonald's omega and Cronbach's alpha of the two factors confirmed the acceptable level of internal consistency of the abortion attitude scale. The CR of the two factors also shows that there is a good composite reliability (Table 05).

Figure 01:- The Final CFA Model with two factors and 8 items (n=364).

Table 05: The indices of the convergent validity, discriminant validity and reliability.

Factor	AVE	MSV	CR	AIC	α	Ω
Factor 01:- Respondents attitudes towards the Soft reasons	0.792	0.054	0.938	0.752	0.923	0.914
Factor 02:- Respondents attitudes towards the Hard reasons	0.671	0.054	0.890	0.586	0.850	0.863
Both factors together				0.430	0.852	0.769

Note: - AVE = Average Variance Extracted, MSV = Maximum Shared Squared Variance, CR = Composite Reliability, AIC = Average inter-item Correlation, α = Cronbach's alpha, Ω = McDonald's omega

Discussion:-

Attitudes towards the abortion have been a special social, political, public health and religious concern in many countries for many years. This study aimed to develop and validate a scale to measure public attitudes towards abortion legislation in the countries where the induced abortion is restricted. The study finalized with an eight-items and two factors scale. The first factor which explained the highest variance of the initial 8 dimension system was named as “attitudes towards soft reasons” whereas the second item was named as “attitudes towards soft reasons”. Those names were given based on solid theoretical ground. Soft reasons are the causes where the people perceive that pregnancy was within the control of the women (which could have been avoided), such as contraceptive failures, bad economic conditions, etc. On the other hand, the “hard reasons” are the causes of pregnancy relatively beyond the women’s control. Previous studies clearly show a significant difference in public attitudes in accepting liberal abortion laws for soft and hard reasons. For example, the majority of respondents agreed to accept liberalization of Sri Lankan abortion laws in the situations of rape (65%), incest (55%) and lethal fetal abnormalities (53%). However, less than one tenth of the population approved the legalization of abortion in the situation of contraceptive failure (6%), bad economic conditions (7%) and on-demand (4%) (19; 17). The proposed scale will facilitate the measurement of this variation by having a factor structure with two latent variables.

Previous studies identified ethnicity, religion, age, years of formal education, marital status, number of living children, and level of knowledge as the factors associated with attitude on induced abortion. It is also noteworthy that as per the findings of the previous studies the factors associated with attitudes towards the soft reasons are significantly different from the factors

associated with hard reasons (18; 6). The newly developed scale will facilitate in-depth analysis of these differences for hard reasons and soft reasons separately.

It is noteworthy to highlight that as per the current study, the two factors (soft and hard) are not strongly related ($r=0.23$) and divergent validity between two factors was proved. Therefore, it is recommended to study the two scenarios separately using two sub-scales to make firm conclusions. This makes sense as legal reform in any country is happening progressively, step-by-step. Studying two scenarios separately will provide strong evidences to inform and influence future advocacy and communication strategies. However, if it is necessary, researchers can analyse both factors together based on the context.

The ultimate objective of developing any scale is to reduce the number of dimensions/variables to make further analysis easier. For this, it is necessary to calculate a score for each participant of the study called factor scores. Most of the researchers preferred to use non-refined factor scores. Ex: - Developing a score by calculating the simple summation or average of the scores (raw score) of the original variables (observed data) loading into a particular factor or the scale. Non-refined scores are easy to calculate and interpret compared to refined scores. Whereas, statistical estimations are required to calculate refined scores. Ex:- Calculating factor scores such as linear combinations of the observed variables which consider what is shared between the item and the factor (i.e., shared variance) and what is not measured (i.e., the uniqueness or error term variance) (43). For the current study, we calculated a non-refined score by calculating simple average of the scale items (Strongly agreed=5, Agreed=4, Neutral=3, Disagree=2, strongly disagree=1) and estimated the correlation with a refined factor score generated by applying a regression method. Results show that two scores are highly correlated for both factors; hard ($r=0.983$, $p<0.001$, $n=728$) and soft ($r=0.986$, $p<0.001$, $n=728$). The refined factor score as well as the non-refined factor score did not follow a normal distribution. This results reveal that researchers can use either a refined e or non-refined score based on their preference.

In 1932, Likert proposed the five-point scale which was commonly used for attitude measurements, and since then, many scales (Ex:- 3, 5, 7, 9) were developed following the same

rule. It is noteworthy that as the number of scale points increase, the variability in the responses, which is a requirement to come up with an accurate statistical analysis is increased. As described by Hair, higher the number of categories in any scale, the broader the spectrum of responses and the data analysis may be more revealing, as it encourages more variability in the final data set. (30). Therefore, in general it is statistically desirable to use 7 point or even 10 point scale to measure attitudes towards complex aspects such as induced abortion. As the abortion attitudes of majority are fairly extreme, either pro-life or pro-choice; previous studies shows that the most of the respondents tend to position them in extreme ends. This polarization of abortion attitude result in low variability in the overall score. Considering this dualistic nature of attitudes towards abortion, Hollis and Morris (1990) used a seven point, Likert-type scale with hopes of increased variance in the responses. They were in the impression that giving participants a chance to answer on a scale with more options (Ex: - one to seven) would result to position a considerable portion of respondents in the middle range of the scale which will ultimately increase the variability of the final data set. However, they still found polarization of opinions in either extremes. Most individuals marked their answers either at the low end (1-3) or at the high end (6-7) (44). Therefore, considering above findings and the practical aspects especially the complexity, the team of experts decided to use five-point scale in this study for the current study. It is noteworthy that the same pattern of polarized attitudes on abortion was observed in the current study too.

One reason why it is important to understand the structure of people's attitudes toward abortion is to use in advocacy and communication campaigns. There may be some beliefs that are easier to change than others. For example, attitude change on abortion rights could depend deeply on personal experience with the issue (11). On the other hand, although everyone do not agree for all, it is important to identify the common areas which majority is in agreement. For an example in our study majority agreed to legalize abortion for hard reasons whereas less than one tenth agreed to legalize abortion for soft reasons. Furthermore, with a reliable and valid measure of attitudes toward abortion, the policy makers will be able to develop laws, policies and programmes which are more acceptable to the general public.

Applications and recommendations for future studies

Findings of this study is expected to fill a major gap of social research in terms of measuring public attitudes towards abortion legislations in Sri Lanka as well as in other countries where abortion laws are highly restricted. Future research may further study the validity of this scale with different social segments (Ex: - In rural and estate sector). Future researchers may use the newly developed scale in constructing data collection instruments to measure the public attitudes on abortion legislations. Result of this study will facilitate to study the deterrents of public attitudes including policy makers in liberalizing abortion laws for soft reasons and hard reasons separately. It is interesting to investigate the religious affiliation, religiosity, political party affiliation including voting behaviors, nationalism as factors associated with attitudes towards abortion legislation by applying the proposed measurement scale. Differences between soft reasons and hard reasons in those factors will provide a significant insight in determining future policy response and planning development programmes.

This study was conducted in the Colombo city of Sri Lanka which cover the urban community of Sri Lanka in general. We couldn't find a credible study on attitudes towards abortion covering entire country and especially the rural and urban sectors. Considering the correlates of attitudes towards abortion, it is reasonable to assume that the attitudes towards abortion of the rural and estate sector residents are considerably different from abortion attitudes of the urban community (45). Future studies may focus on validating the scale for those community segments. Furthermore, the future researchers may seek possibilities apply and validate the newly developed scale in other countries, especially in the countries where the abortion laws are restricted.

As the topic "Abortion" is a controversial issue in many societies including Sri Lanka where this study was conducted, it is quite possible that the respondents will choose socially desirable answers, leading towards wrong conclusions. Future researchers may seeks the possibilities to use the Social Desirability (SD) scale, developed by Crowne and Marlone (46). The scale is composed of 33 items, and the answers can be evaluated being as socially acceptable but not

probable or socially unacceptable but probable. The results from the SD scale can be used to choose which cases are valid in such situations (30; 46).

Conclusion

The proposed scale with 8 items and 2 factors is proved to have high validity and reliability to measure the public attitudes towards abortion legislation especially in the countries where abortion is restricted. It is recommended to study the two factors separately using sub-scales to make firm conclusions. Either refined factor scores or a non-refined factor scores can be used for further analysis based on research objectives.

Ethical Approval and Consent

Data were collected as per the ethical guidelines of the Ethical Review Committee of the Sri Lanka Medical Association. All the data was collected after receiving written informed consent. Ethical approval to conduct this research was granted by the Ethical Review Committee of Sri Lanka Medical Association (Reference Number:- SLMA/ERC 13-049)

Conflict of Interest

Authors declare that there are no conflicts of interest.

External Funding

No external funding to conduct this study.

Data Availability

The data that support the findings of this study are available with the corresponding author and can be obtained upon a reasonable request.

Acknowledgements

The authors acknowledge the work done by members of the field survey team: C.K. De Thabrew, S. De Silva, Wanigasundara, S. Samitha, W.M.K. Wijethunga, S. Tissera, T.R. Agus, N. Liyanage, R.M.D.K. Rajakaruna, S.D.K.P. Senadhira, A.M.A.S. Bandara, J. Dewasurendra, N. de Rosayro, T. Moonasinghe, H. Wickramasinghe, M. Deshapriya, R.V.P. Rajapakshe, T. Wickramaratne, A.C. Hettiarachchi, M. Samarawickrama, K. Yogeshwaran, K. Sirinivasan, S. Godakanda, J. Vidanapathirana, A. Rahman, P. Agrawal, M. Sen, W.I. De Silva, and N.K. Weerasinghe for their valuable contribution to conduct this study.

References

1. **WHO**. *Reproductive Health Strategy*. Geneva, Switzerland : World Health Organization, 2008.
2. **Suranga, M Suchira and De Silva, W Indralal**. Induced Abortion. [ed.] W Indralal De Silva. *Sri Lankan Youth: Sexual and Reproductive Health; Profile, Knowledge, Attitude, Behaviour & Vulnerability*. Colombo, Sri Lanka : ChildFund Sri Lanka, 2020, pp. 176-188.
3. **WHO**. *Unsafe abortion: global and regional estimates of the incidence of unsafe abortion and associated mortality in 2008*. 6th. Geneva, Switzerland : World Health Organization, 2011. ISBN 978 92 4 150111 8.
4. **World Population Review**. World Population Review. *Countries Where Abortion Is Illegal 2021*. [Online] World Population Review, 2021. [Cited: September 29, 2021.] <https://worldpopulationreview.com/country-rankings/countries-where-abortion-is-illegal>.
5. **Jelen, Ted G and Wilcox, Clyde**. *Causes and Consequences of Public Attitudes towards Abortion: A review and Research Agenda* . Long Beach : Western Political Science Association, 2003.
6. *Unsafe abortions in Sri Lanka –facts and risk profile*. **Thalagala, N.** 1, Colombo : s.n., 2010, Journal of the Community Physicians of Sri Lanka, Vol. 15.
7. **Senanayake , Lakshman, Willatgamuwa, S and Jayasinghe, K**. *Reducing the burden of unsafe abortion in Sri Lanka - A situation analysis and plan of action*. Colombo : The Family Planning Association of Sri Lanka, 2008.
8. *A Technique for the Measurement of Attitudes towards Abortion*. **Bardis, P.** 1, 1972, International Journal of Sociology of the Family, Vol. 2, pp. 98-104.
9. *Development of a dual-form abortion scale, , 15:2, 158-165, DOI: .* **John , K Bowers and Herbert, B Weaver.** 2, 1979, The Journal of Sex Research, Vol. 15, pp. 158-165.
10. *The development of instruments to measure attitudes toward abortion and knowledge of abortion*. **Snegroff, S.** 5, 1976, Journal of School Health, Vol. 46.
11. *The measurement of attitudes toward abortion*. **Taylor, Michael G and Whitehead, George I.** 1, 2014, Modern Psychological Studies, Vol. 20.

12. *Attitudes toward Abortion, Religion, and Party Affiliation among College Students.* **Hess , J A and Rueb, J D.** 1, 2005, *Current Psychology*, Vol. 24, pp. 24-42.
13. *Abortion Attitudes as Determinants of Perceptions Regarding Male Involvement in Abortion Decisions.* **Coleman, K Priscilla and Nelson, S Eileen.** 44, 1999, *Journal of American College Health*, Vol. 47, pp. 164-171.
14. *69% of U.S. Now Approve Legal Abortion for Six Specified Reasons; up Since 1980.* **Guttmacher Institute.** 4, 1982, *Family Planning Perspectives*, Vol. 14, pp. 214-215.
15. *Race differences in the determinants of support for legalized abortion.* **Dugger, K.** 3, s.l. : University of Texas Press, 1991, *Social Science Quarterly*, Vol. 72, pp. 570-587.
16. *Measuring public attitudes on abortion: methodological and substantive considerations.* *Fam Plann Perspect.* **Cook, E A, Jelen , T G and Wilcox, C.** 3, 1993, *Family Planning Perspectives*, Vol. 25, pp. 118-121.
17. *Access to information and attitudes towards induced abortion: a community-based study among adults in the City of Colombo, Sri Lanka.* **Suranga M, M Suchira, Silva, Kalinga Tudor and Senanayake , Lakshman.** 1, 2017, *Journal of the College of Community Physicians of Sri Lanka,,* Vol. 23, pp. 28-38.
18. *Factors Associated with Altitudes on Induced Abortion : a community based study in the Colombo City of Seri Lanka.* **Suranga, M Suchira, Silva, Kalinga Tudor and Senanayake, Laxman.** 1, 2015, *Sri Lanka Journal of Advanced Social Studies*, Vol. 5, pp. 41-55.
19. *Perception on the abortion laws in Sri Lanka: A community based study in the city of Colombo.* **Suranga, M Suchira, Silva KT, Kalinga Tudor and Senanayake, Laxman .** 4, 2016, *Ceylon Medical Journal*, Vol. 61, pp. 171-175.
20. **Penel Code Sri Lanka - Section 303.** *Penel Code Sri Lanka - Section 303.* 1883.
21. **Penel Code Sri Lanka - Section 304.** *Penel Code Sri Lanka - Section 304.* 1883.
22. *The Practice of Induced Abortion in Sri Lanka.* **De Silva, W. I.** s.l. : Boston : Harward School of Public Health, 1997. Vol. 137. *Takemi Program in International Health* 137.
23. **Department of Census and Statistics.** *Census of Pupulation and Housing - 2011.* Colombo : Department of Census and Statistics, 2012.
24. **Department of Economic and Social Affairs, Statistics Division, United Nations Secretariat.** *Designing Household Survey Samples: Practical Guidelines .* [Online] Series F No.98 - ST/ESA/STAT/SER.F/98, 2005. [Cited: Jnuary 15, 2013.] <http://unstats.un.org/unsd/demographic/sources/surveys/Handbook23June05.pdf>.
25. *Development and validation of attitudes measurement scales: fundamental and practical aspects.* **Joseph, F Hair, et al.** 4, s.l. : Emerald Publishing Limited, 2019, *RAUSP Management Journal*, Vol. 54.
26. **Marjorie A. Pett, A Pett, Nancy , R Lackey and John, J Sullivan.** *Making Sense of Factor Analysis; The Use of Factor Analysis for Instrument Development in Health Care Research.* London : Sage Publications, 2003.

27. *Chi-square for model fit in confirmatory factor analysis*. **Alavi , Mousa , et al.** 9, 2020, Journal of Advance Nursing, Vol. 76, pp. 2209-2211.
28. *Structural Equation Modelling: Guidelines for Determining Model Fit*. **Hooper, Daire , Coughlan, Joseph and Mullen, Michael R.** 1, 2008, The Electronic Journal of Business Research Methods, Vol. 6, pp. 53-60.
29. **Fornell, C.** *A Second Generation of Multivariate Analysis; an overview* . New York : s.n., 1982.
30. **Hair, Joseph F, et al.** *Multivariate Data Analysis: Global Edition*. 7th. London : Pearson Education, 2010.
31. *Evaluating Structural Equation Models with Unobservable Variables and Measurement Error*. **Fornell , Claes and Larcker , David F.** 1, 1981, Journal of Marketing Research, Vol. 18, pp. 39-50.
32. **Baykal, Elif.** *Handbook of Research on Positive Organizational Behavior for umproved workplace performance*. ist . Hershey PA, USA : IGI Global, 1983.
33. **Stephanie, R.** Composite Reliability: Definition. [Online] 2019. [Cited: December 19, 2021.] <https://www.statisticshowto.com/composite-reliability-definition/>.
34. *Composite Reliability in Structural Equations Modeling*. **Bacon, Donald R, Sauer, Paul L and Young, Murray** . 3, 1995, Educational and Psychological Measurement, Vol. 55, pp. 394-406.
35. *Coefficient alpha and the internal structure of tests*. **Cronbach, L.** 1951, Psychometrika, Vol. 16, pp. 297-334.
36. *Making sense of Cronbach's alpha*. **Tavakol, Mohsen and Dennick, Reg** . 2011, International Journal of Medical Education, Vol. 2, pp. 53-55.
37. *Testing the Difference Between Reliability Coefficients Alpha and Omega*. **Deng, Lifang and Chan, Wai** . 2, 2017, Educational and Psychological Measurements , Vol. 77, pp. 185-203.
38. **Glen, Stephanie** . Average Inter-Item Correlation: Definition, Example. *Statistics How To; Elementary Statistics for the rest of us*. [Online] 2018. <https://www.statisticshowto.com/average-inter-item-correlation/>.
39. **Hayes, A F and Coutts, J.J.** Use omega rather than Cronbach's alpha for estimating reliability. But... Communication Methods and Measures. *Andrew F. Hayes*. [Online] University of Calgary, 2020. [Cited: September 2, 2021.] <http://afh Hayes.com/spss-sas-and-r-macros-and-code.html>.
40. *An overview of coefficient alpha and a reliability matrix for estimating adequacy of internal consistency coefficients with psychological research measures*. **Ponterotto, Joseph G and Ruckdeschel, E Daniel.** 3, s.l. : SAGE Journals, 2007, Perceptual and Motor Skills , Vol. 105, pp. 997-1014.
41. *Development and Validation of the Knowledge and Attitude Scale Toward COVID-19 Pandemic Breaking Transmission Chain (KA-C) Among Iranian Population*. **Abounoori, Mahdi , et al.** 627013, 2021, Frontiers in Public Health, Vol. 9.
42. *Factor Analysis and Structural Equation Modeling With SPSS and AMOS*. **Sharif S , Pahlevan S and Nia, Sharif H.** 2020.

43. *Understanding and Using Factor Scores: Considerations for the Applied Researcher*. **DiStefano, Christine, Zhu, Min and Mîndrilă, Diana** . 20, 2009, Practical Assessment, Research & Evaluation, Vol. 14. ISSN 1531-7714.
44. *Attitudes toward abortion in female undergraduates*. **Hollis, M H and Morris, T M**. 1, 1992, College Student Journal, Vol. 26, pp. 70-74.
45. **Suranga, Mullege Suchira, Silva, Kalinga Tudor and Senanayake, Lakshman** . *Knowledge and Attitudes of Adults Concerning Induced Abortion in Colombo City, Sri Lanka*. Peradeniya, Sri Lanka : Master of Philosophy Thesis; University of Peradeniya, 2016.
46. *Marlowe-Crowne social desirability scale*. **Crowne, P D**. 1, 1960, Journal of Consulting Psychology, Vol. 24, pp. 349-354.