

**RESEARCH PAPER.**

## Translation and validation of Impact of Events Scale-Revised (IES-R) questionnaire to assess the Psychological Distress following miscarriage in a Sri Lankan group of women

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### ABSTRACT

Miscarriages can cause a significant impact on the psychological and emotional well being of many women, with considerable distress adversely affecting the quality of life. The Impact of Events Scale-Revised (IES-R) was designed to assess the current subjective psychological distress for any specific life event and psychological response patterns associated with such experiences. The objective of this study was to validate a Sinhala translation of IES-R questionnaire to assess the psychological distress among a group of Sri Lankan women following miscarriage. This validation study was conducted in the Galle district at the Gynecology ward of the Teaching Hospital Mahamodara, including 106 women who were diagnosed with miscarriage. The original IES-R was translated into Sinhala language and judgmental validity was ensured by an expert panel. Appropriate analyses both at the item and scale levels were conducted to assess the validity and reliability. Convergent validity was calculated between the total IES-R score and the total GHQ score, which provided a statistically significant correlation of 0.66 ( $p < 0.01$ ). Construct validity demonstrated item scale correlations exceeding 0.4 with its own scale, and confirmatory factor analysis supported the three-factor model similar to its original three subscales with good fit indices (Intrusion, Avoidance and Hyperarousal). The Sinhala IES-R also demonstrated a good internal consistency with Cronbach's alpha value for the whole score (0.91) and for its 3 subscales (ranging from 0.78 to 0.83). The test - retest reliability of three subscales showed satisfactory correlation coefficients exceeding 0.9, although the retest was done in a sample of 15 women after 2.7 days. The Sinhala version of the IES-R has satisfactory validity and reliability to assess psychological distress among Sri Lankan group of women following miscarriage.

**Key words:** Validation, Psychological Distress, Pregnancy

## INTRODUCTION

Pregnancy is considered as a special time in a woman's life. There are several physiological as well as psychological changes and emotional responses occurring during this period. Sense of fulfillment as a woman, future hopes and the expectations of the woman, her partner and the family as well as cultural and religious influences of the society contribute to the complex emotional response. Not all the pregnancies end up in live births, but a fifth of pregnancies are lost during the early gestational period. These miscarriages can cause an impact on the psychological and emotional wellbeing with considerable distress adversely affecting the quality of life of many women<sup>1,2</sup>.

The current evidence is that about 50% of miscarriages are associated with significant psychological morbidity, weeks and months after the event<sup>3</sup>. Majority of women are not mentally prepared for this unexpected loss and the experience leads to adverse emotional consequences, such as grief (40%), anxiety (45%) and depressive disorders (10-50%), which may persist for a long period<sup>3-8</sup>.

The importance of follow up has been evaluated in certain studies which may also affect the subsequent pregnancies<sup>14,15</sup>. Perceptual discrepancy between the patient and the care giver is being found in few studies and most women are dissatisfied with the care given to them, mainly in the view of psychological support<sup>14</sup>. Therefore, a proper evaluation of the psychological/emotional status of the women with early miscarriage is important. Miscarriage is a distress for women who experience it. Those who receive treatment for miscarriage at wards should be cared for their psychological health as well. Therefore, it is important to assess their distress by using a valid and reliable tool.

The Impact of Events Scale-Revised (IES-R) measures the current subjective psychological distress associated with traumatic life events, as well as the psychological response patterns related to such experiences<sup>19,20</sup>. It has been widely used in other countries to evaluate the emotional aftermath of the miscarriage<sup>4,8,11,16</sup>. IES-R measures subject levels of intrusive thoughts (involuntary thoughts and images of the event), avoidance (denial of the meaning and consequences of the event) and hyperarousal (Excessive responsiveness to sensory stimulation) which are identified commonly after experiencing a stressful life event.

## METHODS

Self administered questionnaire was given to women with miscarriage, confirmed by ultrasound scanning, getting admitted to the gynecology ward of Teaching Hospital Mahamodara. Age between 18 to 35 years, Gestational age between 06 weeks to 24 weeks were included for the study. Women with threatened miscarriage, Women with recurrent miscarriage (three or more) and women with past history of psychiatric illnesses were excluded.

Two study instruments were used. The IES-R includes 22 items that measures symptoms of intrusion (dreams about the event), avoidance (effort to avoid reminders of the event) and hyperarousal (feeling watchful and on guard) with regard to a particular stressful life event. Eight items dealt with intrusion subscale, another eight items dealt with avoidance subscale and six items with hyperarousal subscale. Participants are rated on a 5-point Likert scale (0,1,2,3,4), to the extent where each item applies to their experiences during the last seven days. The total score of IES-R ranges between 0 and 88 and mean of each

subscale also can be calculated ranging from 0 to 4.

The GHQ-30 is one of the widely used instrument for the assessment of mental wellbeing, and for detecting psychiatric morbidity, in hospital and outpatient settings. It has been translated into Sinhala Language and validated previously. Responses of the study participants were rated on a Likert scoring (0-1-2-3) system as in IES-R which ranges from 0 to 90.

SPSS and LISREL software were used for the statistical analysis part of the data.

Calculation of convergent validity was done by comparing total scores of IES-R and GHQ scales to determine the correlation coefficient using Spearman method since the data showed a non-normal distribution.

Construct validity was assessed by using multitrait scaling matrix in order to compare the correlation coefficients between domain scores and individual scores. Minimum correlation considered was 0.4 and highest correlation of individual item with domain scores was considered.

Since the tool had well established domain structure in different settings a confirmatory factor analysis (CFA) was done on the scores obtained in the validation study using LISREL software. Single factor and three factor model were checked with fit indices to assess whether they met with following indices.

Satorra bentler chi square

GFI - Goodness to fit index (GFI) > 0.9 desired

NNFI - Non-normed fit index (NNFI) > 0.9 desired

CFI - Comparative fit index (CFI) > 0.9 desired

RMSEA - Root Mean Square error of approximation (RMSEA) < 0.05 desired

SRMR - Standardized root mean square residual (SRMR) < 0.08 desired

Internal consistency was calculated with Cronbach alpha for each subscale of IES-R to assess the reliability. Cut-off value of 0.7 was considered significant.

Test re-test reliability was assessed using correlation coefficients of each subscale following administration of both questionnaires in a selected sample consisting of 15 individuals who stayed in the ward for more than two days.

Confirmatory factor analysis was performed on the scores obtained in the validation study using LISREL. Before carrying out the CFA, numerous statistical tests were performed to ensure that the data was compatible with the statistical assumptions required for CFA.

Sample Size - According to Tabachnic and Fidel (1996), the sample size should be of 5-10 times the number of items in the instrument. However, they recommended that a sample size of 106 is adequate for small to medium size models. Since this sample consists of 106 subjects compared to 22 items in the questionnaire, the ratio of case to variable was approximately 4.8 : 1. Two methods were used to assess the Multivariate Normality - Normality of the data.

1. Inspection of all items histogram was carried out. Visual inspection of several items had revealed a non-normal distribution.
2. Standardized skewness and kurtosis scores were calculated for all 22 items.

The skewness and kurtosis statistics are summarized in table 5.6.

According to Joreskog and Sorbom 1996, standardized skewness and kurtosis values

greater than +/- 3 indicate unacceptability high level of skewness and kurtosis.

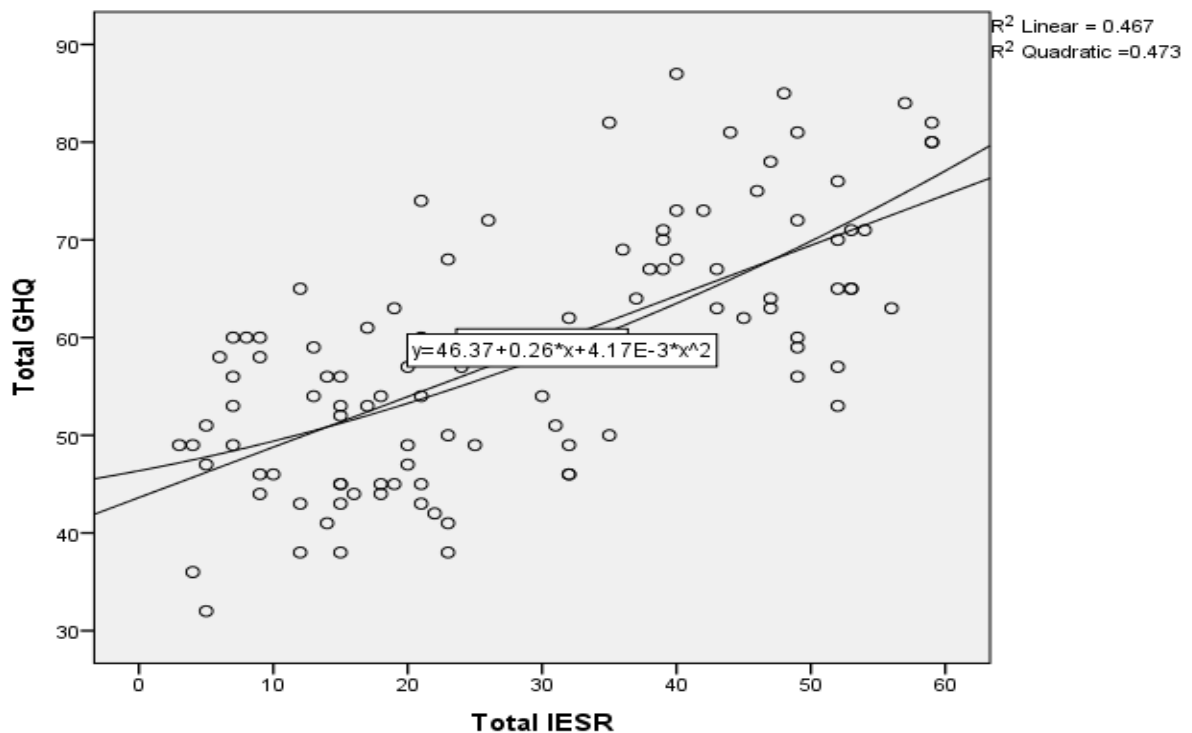
However, it was reasonable to assume skewness and kurtosis in this data set since they were consisted of data on participants' feelings and emotions. Therefore, according to the guideline in LISERAL<sup>17</sup> robust maximum likelihood estimation was used for the CFA. This technique is adjusted for non-normality of the data and fit estimation was done by Satorra Bentler chi square scaled chi square.

**RESULTS**

Response rate was 91.37% (n=106) of those who were admitted with miscarriages recruited by convenient sampling technique. Eleven samples (9.4%) were removed from the analysis due to nonadherence with the selection criterias and incompleteness of data. Of the sample, mean age was 28.56 years (SD = 4.375 years) and median was 29.5 years (Inter Quartile Range = 7.25 years). Mean POA of

the sample was 11.4 weeks (SD = 4.2 weeks)

Forward translation of the questionnaire was done by two translators and backward translation was done by another two translators. The back translated questionnaire was checked against the original one to ensure the consistency. Assessment of content validity was carried out by a panel of ten experts in the field of Obstetrics and Gynecology, Psychiatry, Psychology and Community Medicine. The experts were asked to give a rating of 1 to 10 for each item in the IES-R for their relevance in the meaning of psychological distress, acceptability in the local context and the appropriateness of wording used separately. All 22 components obtained higher values denoting the the Sinhala translation measures the same as in original instrument and necessary changes done which were recommended and reviewed by the expert panel.



**Figure 1 Graph showing total GHQ score Vs. Total IES-R Score**

There was a statically significant correlation between total IES-R score and total GHQscore ( $r = 0.66$ ) (Figure 1). Item convergent validity was confirmed for all 22 items in the three subscales, where each item had a correlation coefficient  $\geq 0.4$  with

its own subscale. Items discriminant validity was also evident in all 22 items, where individual item had better correlation with its own subscale compared to the other Two subscales (Table 1).

**Table 1: Multitrait scaling matrix of correlations coefficients of the IES-R scores (n=106)**

		Intrusion Score	Avoidance Score	Hyperarousal Score
Int	1. Any reminder brought back feelings about it.	<b>.645</b>	.399	.522
Int	2. I had trouble staying asleep.	<b>.666</b>	.473	.556
Int	3. Other things kept making me think about it.	<b>.730</b>	.534	.715
Int	6. I thought about it when I didn't meant to.	<b>.848</b>	.597	.743
Int	9. Pictures about it popped into my mind	<b>.778</b>	.446	.635
Int	14. I found myself acting or feeling like I was back at that time.	<b>.529</b>	.219	.439
Int	16. I had waves of strong feelings about it.	<b>.756</b>	.412	.593
Int	20. I had dreams about it.	<b>.440</b>	.059	.346
Avo	5. I avoided letting myself get upset when I thought about it or was reminded of it.	.346	<b>.512</b>	.245
Avo	7. I felt as if it hadn't happened or wasn't real.	.022	<b>.375</b>	.021
Avo	8. I stayed away from reminders of it.	.281	<b>.713</b>	.352
Avo	11. I tried not to think about it.	.336	<b>.741</b>	.337
Avo	12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.	.475	<b>.759</b>	.422
Avo	13. My feelings about it were kind of numb.	.465	<b>.637</b>	.451
Avo	17. I tried to remove it from my memory.	.478	<b>.781</b>	.404
Avo	22. I tried not to talk about it.	.479	<b>.684</b>	.449
Hyp	4. I felt irritable and angry.	.584	.340	<b>.641</b>
Hyp	10. I was jumpy and easily startled.	.499	.298	<b>.678</b>

Hyp	15. I had trouble falling asleep.	.594	.338	<b>.708</b>
Hyp	18 I had trouble concentrating.	.657	.477	<b>.665</b>
Hyp	19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.	.606	.446	<b>.714</b>
Hyp	21. I felt watchful and on-guard.	.542	.379	<b>.660</b>

Negative signs of some correlations, that as an artifact of scoring procedure had been omitted. Item scale correlations exceeding 0.4 with its own scale for item convergent

validity, shown in bold typing. Evidence of item discriminant validity where an item correlates higher with its own sub scale than with other sub scales were shown (Table 1).

**Table 2: Mean, SD, Skewness and Kurtosis of the scores of the IES-R (N=106)**

Item	Mean	SD	Skewness			Kurtosis		
			Statistic	SE	Standardized Skewness	Statistic	SE	Standardized Kurtosis
1	1.16	1.12	0.726	.235	<b>3.08</b>	-.799	-.465	1.71
2	1.14	1.15	0.751	.235	<b>3.19</b>	-.473	-.465	1.01
3	1.04	1.21	0.747	.235	<b>3.17</b>	-.833	-.465	1.79
4	.89	1.206	1.152	.235	<b>4.90</b>	0.102	-.465	0.21
5	1.78	1.295	0.039	.235	0.00	-1.212	-.465	2.60
6	1.45	1.36	0.495	.235	2.10	-1.060	-.465	2.27
7	1.00	1.163	0.889	.235	<b>3.78</b>	-.188	-.465	0.40
8	1.35	1.288	0.574	.235	2.44	-.879	-.465	1.89
9	1.42	1.379	0.502	.235	2.13	-1.084	-.465	2.33
10	1.40	1.350	0.592	.235	2.51	-.855	-.465	1.83
11	1.54	1.274	0.421	.235	1.79	-.913	-.465	1.96
12	1.28	1.248	0.703	.235	2.99	-.470	-.465	1.01
13	1.18	1.286	0.808	.235	<b>3.43</b>	-.459	-.465	0.98
14	.75	1.188	1.413	.235	<b>6.01</b>	0.852	-.465	1.83
15	1.12	1.16	0.837	.235	<b>3.56</b>	-.396	-.465	0.85
16	1.32	1.356	0.610	.235	2.59	-.933	-.465	2.00
17	1.58	1.524	0.321	.235	1.36	-1.431	-.465	<b>3.07</b>
18	.87	1.235	1.307	.235	<b>5.56</b>	0.515	-.465	1.10
19	1.04	1.287	0.995	.235	<b>4.23</b>	-.235	-.465	0.50
20	1.49	1.368	0.532	.235	2.26	-.862	-.465	1.85
21	2.37	1.347	-0.177	.235	0.75	-1.344	-.465	2.89
22	1.42	1.286	0.356	.235	1.51	-1.100	-.465	2.36

\*Standardized Skewness and Standardized Kurtosis values exceeding 3.00 are shown in bold typing

Linearity - LISREL assumes that all items in the model tested, are linearly related to each other. Bivariate scatter plots were inspected to assess the linearity of data. A random sample of bivariate scatter plots

was examined, since it was not practical to examine all of them. Linear relationship was observed in all the examined scatter plots.

Outliers – Since the interpretation of results may be interfered with the existence of outliers, data was examined with the use of boxplots for univariate outliers. There were no univariate outliers found in the data set.

Multicollinearity – Interpretation of the results also can be hindered by the high or perfectly correlated items in the model. Therefore, bivariate correlations were examined between the items. Since the highest correlation observed between two items was 0.765, it was reasonable to assume that, none of the two items were

highly correlated or perfectly correlated.

After ensuring that the data set is compatible with the statistical assumptions required, CFA was performed on the covariance matrix of IES-R. The robust maximum likelihood method was used to estimate the model parameters.

LISREL recommends this method for non-normal data. Initially a one factor model was tested where all items were expected to load on to one latent factor (Figure 2).

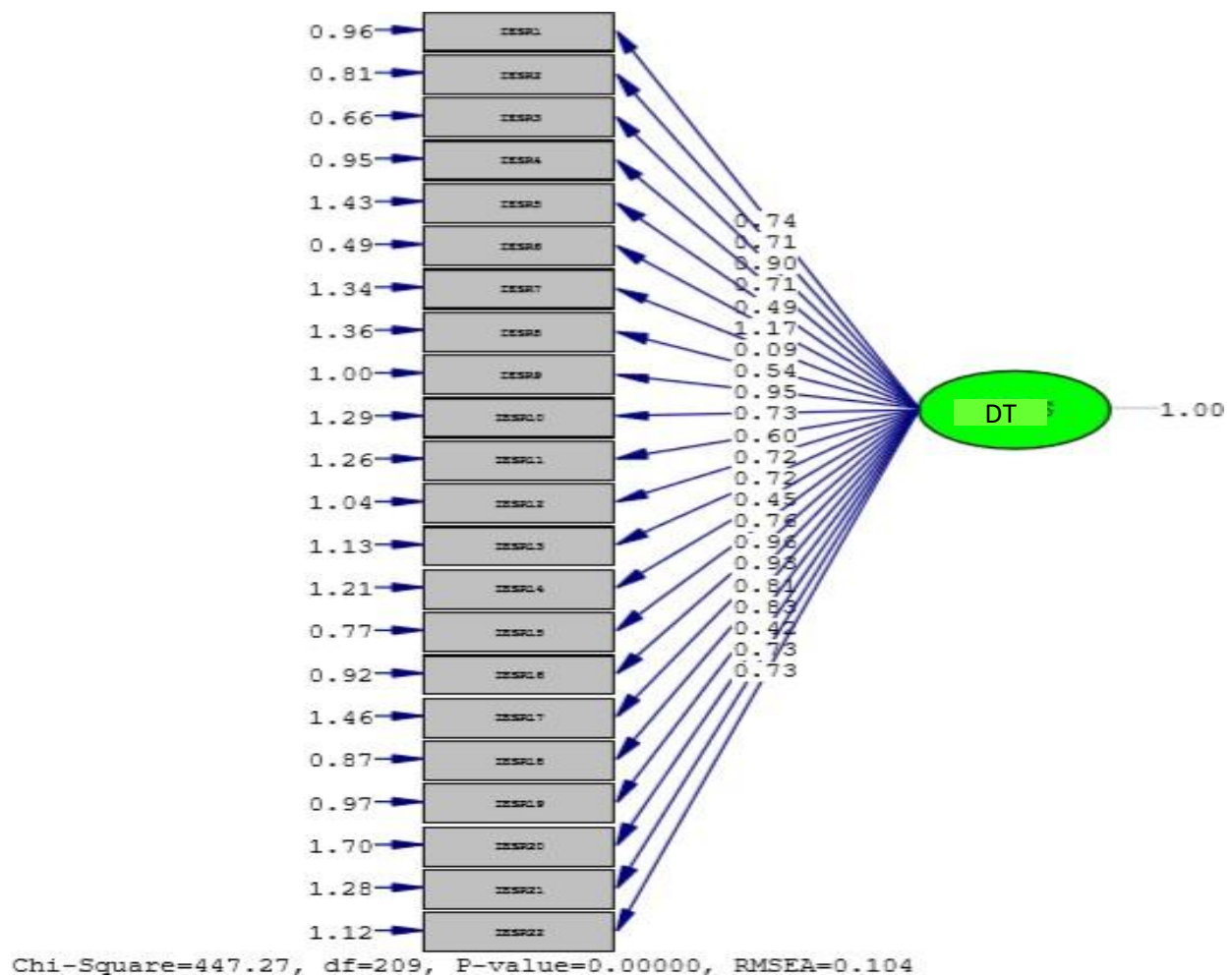


Figure 2: Path diagram of one factor model

This model did not show acceptable fit to the data. Therefore, widely accepted three factor model was tested where 8 items were

expected to load on to Intrusion, 8 items were expected to load on to avoidance and 6 items were expected to load to hyper-

arousal subscales. Although three item model (Figure 3) performed better than the one factor model, still the overall model fit was not satisfactory. The original three factor model was modified based on suggestions for improvement of model fit offered by LISERAL. The error covariance

were added between IESR 8 & 7, IESR 14 & 5, IESR 16 & 7, IESR 17 & 14, IESR 18 & 5, IESR 19 & 7, IESR 20 & 17 and IESR 20 & 19 as suggested by LISERAL for original three factor model. Accordingly, modified three factor model was drawn (Figure 4).

**Table 3-5.7: Summary of model fit statistics for one factor, three factor and modified three factor models of IES R**

Model	Absolute fit indices				Comparative fit Indices			Parsimony fit indices	
	$\chi^2$	P	RMSEA	GFI	SRMR	NNFI	CFI	PGFI	PNFI
One Factor	447.27	0.00	0.10	0.68	0.099	0.90	0.91	0.56	0.77
Three Factor	341.12	0.00	0.079	0.74	0.086	0.94	0.95	0.60	0.79
Modified Three Factor	249.65	0.0075	0.050	0.78	0.078	0.98	0.98	0.61	0.79

$\chi^2$  - Satorra bentler chi square, GFI - Goodness to fit index (GFI) > 0.9 desired NNFI - Non-normed fit index (NNFI) > 0.9 desired CFI - Comparative fit index (CFI) > 0.9 desired RMSEA - Root Mean Square error of approximation (RMSEA) - (< 0.05 desired) SRMR - Standardized root mean square residual (SRMR) - < 0.08 desired

According to the chi square value one factor model and original three factor model did not seem to fit to the data ( $p < 0.000$ ). However, when compared to one factor model, original three factor model showed considerable improvement in the other fit indices like GFI, NNFI and CFI. But considering the GFI of 0.74 (desired value > 0.9) and RMSEA of 0.07 (desired value < 0.05), the three factor model appeared to have room for further

improvement. When modified three factor model is considered RMSEA, SRMR, NNFI and CFI indices showed a model fit. The results of this confirmatory factor analysis support a modified three factor model with correction for error covariance compared to original three factor model and one factor model (Table 4).



**Table 4-: Factor loading of IES-R items in the confirmatory factor analysis of the three factor model**

<b>Factor</b>	<b>Item</b>	<b>Factor loading</b>
<b>Intrusion</b>		
	1	0.83
	2	0.82
	3	1.73
	6	1.36
	9	1.40
	14	2.08
	16	1.34
	20	0.58
<b>Avoidance</b>		
	5	0.81
	7	0.57
	8	0.97
	11	0.90
	12	1.25
	13	1.23
	17	2.41
	22	1.39
<b>Hyper-arousal</b>		
	4	1.33
	10	0.97
	15	0.73
	18	1.29
	19	1.44
	21	0.55

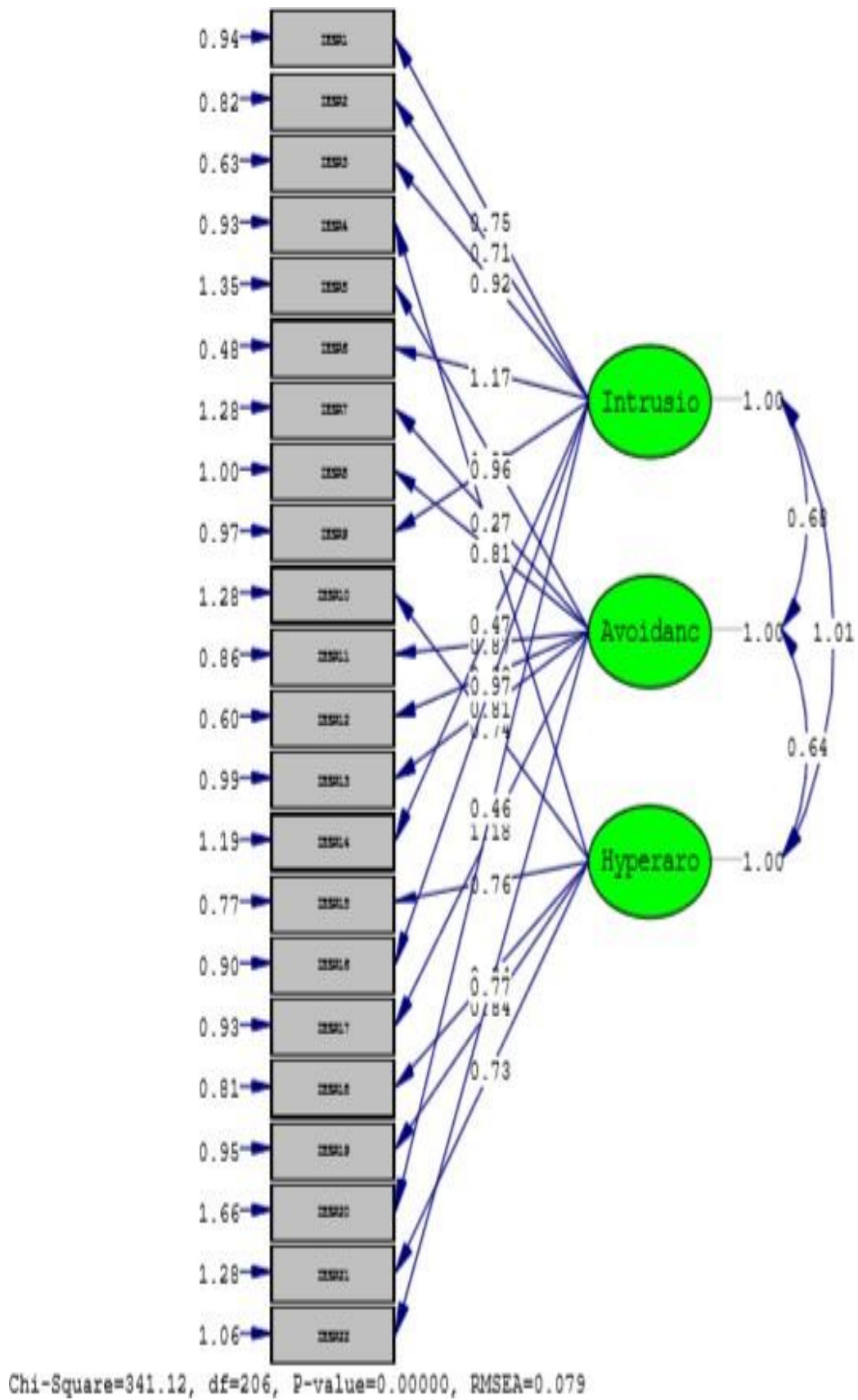
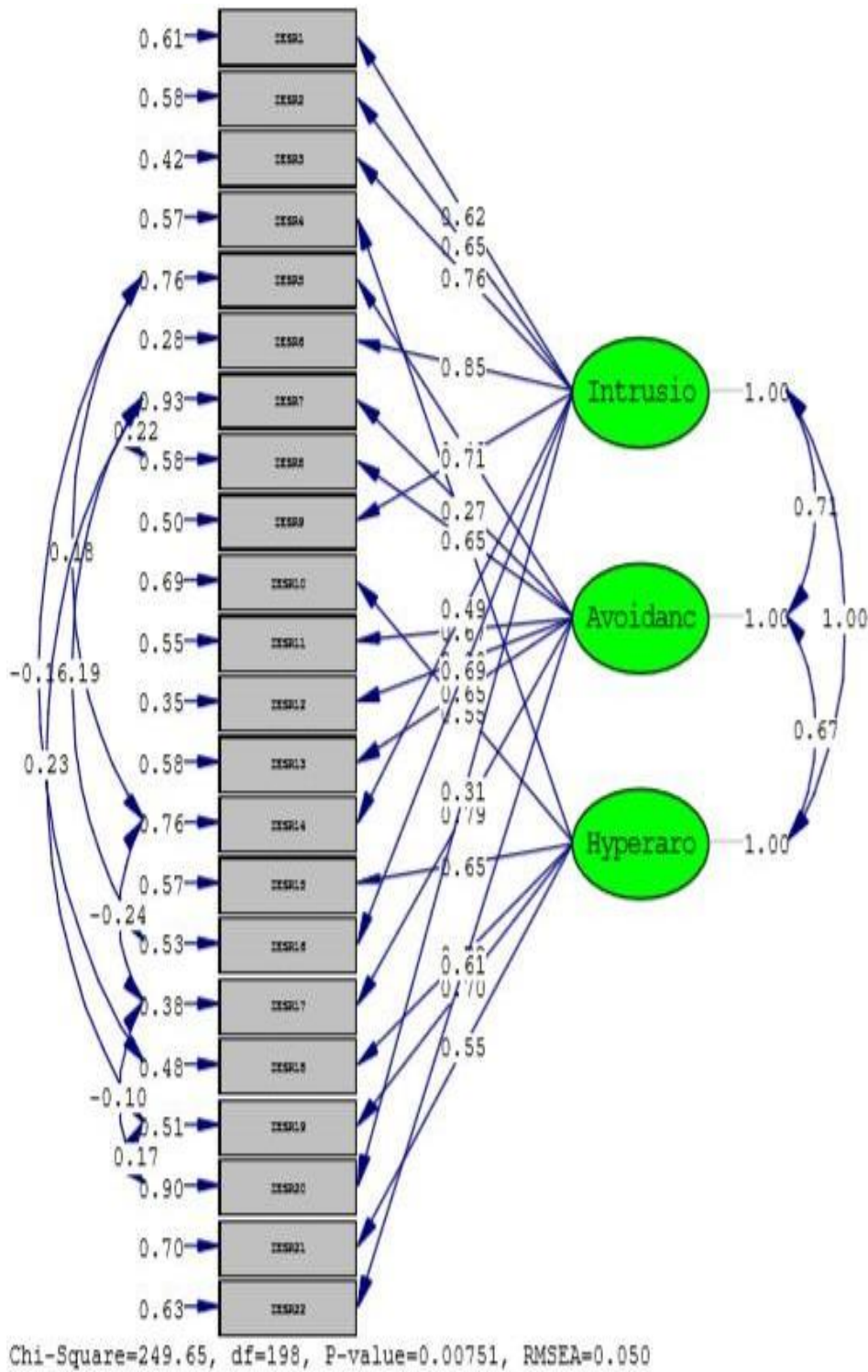


Figure 3: Path diagram of 3 factor model



**Figure 4 5.5: Path diagram of modified 3 factor model**

Assessment of internal consistency was done by calculating the Cronbach alpha for each subscale of IES-R scale. According to this, all three subscales demonstrated high

internal consistency with Cronbach’s alpha values greater than the Nunnally’s criteria of 0.7 (Table 5)

**Table 5 – Cronbach alpha values for each sub scales**

Subscale	Number of items	Cronbach's alpha	Interclass Correlation Coefficient	95% Confidence Interval	
				Lower bound	Upper bound
Intrusion	08	0.834	0.385	0.306	0.473
Avoidance	08	0.816	0.357	0.282	0.445
Hyperarousal	06	0.780	0.372	0.288	0.465
All scales	22	0.908	0.311	0.252	0.384

**Table 6 : Test re-test reliability of the three subscales**

Subscale	Correlation Coefficient	P value
Intrusion	0.970	0.01
Avoidance	0.946	0.01
Hyperarousal	0.960	0.01

Three items from each domain were selected randomly for each item's scores. Related-Sample Wilcoxon Signed Rank

Test was applied with the null hypothesis that there is no differences of medians (Table 7).

**Table 7: Difference between medians of selected items' test and retest**

Item	Significance	Decision
IES-R 1	0.157	Retain the null hypothesis
IES-R 3	1.000	Retain the null hypothesis
IES-R 9	1.000	Retain the null hypothesis
IES-R 5	0.102	Retain the null hypothesis
IES-R 11	0.317	Retain the null hypothesis
IES-R 17	0.623	Retain the null hypothesis
IES-R 4	0.317	Retain the null hypothesis
IES-R 18	0.105	Retain the null hypothesis
IES-R 21	0.317	Retain the null hypothesis

## DISCUSSION

The Impact of Events Scale-Revised (IES-R) was originally designed to study the Post Traumatic Stress Disorder (PTSD). However, it assess the current subjective psychological distress for any specific life event and psychological response patterns associated with traumatic life events.<sup>19,20</sup>

Miscarriage is considered as a traumatic life event and IES-R has been widely used in other countries to evaluate the emotional aftermath of a miscarriage.<sup>4,8,11,16</sup> Therefore, considering the fact that the psychological morbidity following miscarriage ranges from 40 – 54% in Sri

Lankan setting<sup>17,18</sup> and the present study provides preliminary data regarding Sinhala validated IES-R among the women with miscarriage, suggesting its potential application of assessment of psychological distress in terms of clinical management and research purposes.

This study assessed the content, convergent, construct validity as well as internal consistency and test re-test reliability of Sinhala translation of the IES-R in a group of Sri Lankan women following miscarriage.

The mean IES-R score was 28.6 in our study, higher than the mean score (16) obtained in a Chinese study done by Cheung CS et al. which also assessed the psychological distress following miscarriage in a cohort of women at Hong Kong<sup>8</sup>. Mean item scores of Intrusion, Avoidance and Hyperarousal subscales (1.22, 1.39 and 1.28) were also higher than the Hong Kong women which were 0.63, 0.63 and 0.83, respectively. The socio-demographic variables were quite similar in both studies, but higher values among Sri Lankan women might be due to the cultural and social influences contributing to the emotional response after a miscarriage.

Assessment of content validity was carried out by comparing the original IES-R with the back translated English questionnaire by a panel of ten experts in the field of Obstetrics and Gynecology, Psychiatry, Psychology and Community Medicine. Each item was rated between a scale of 1 to 10 for their relevance in meaning psychological distress, suitability of the wording used and appropriateness in the local setting separately. Appropriate

changes were done to the final version which was accepted by the expert panel ensuring the Sinhala translation measures the same as in the original English version. To evaluate the convergent validity, Spearman correlation coefficient was calculated between the total IES-R score and the total GHQ score. Statistically significant correlation of 0.66 ( $p < 0.01$ ) was obtained which is better than the other studies which ranged from 0.37 to 0.64. Out of these studies, French validation (Brunet A et al.) was done among a sample of women who were exposed to a natural disaster during or preceding pregnancy, in which the Pearson correlation coefficient was calculated between the total IES-R score and the total GHQ-28 score<sup>27</sup>. The other study was done in a group of subjects who have experienced a life-threatening event and attending the Accident and Emergency Services in Hong Kong by Wu KK et al.<sup>28</sup>. In that the comparison was done between the subscale scores of IES-R and the total score of GHQ-20 with Pearson correlation coefficient. Although these two studies were carried out in different settings, both compared the IES-R and the GHQ. Positive correlations of IES-R and GHQ scores in all three studies reflect the traumatic nature of the miscarriage which is comparable to the other life-threatening events.

Multi-trait scaling matrix of correlation coefficients of IES-R was used to evaluate the construct validity where comparison between the domain score with each item of the questionnaire was done. Highest correlation exceeding 0.4 were shown between each subscale and its own items as indicated in the original IES-R. Since this questionnaire is validated in many countries and its structure has been

confirmed, exploratory factor analysis was not done. Confirmatory factor analysis supported a modified three factor model compared to the one factor and three factor model, where factor loading was  $> 0.5$  for all factors after it was corrected with an error covariance suggested by LISREL. Factor analysis of French and Chinese studies also favored the three-factor model since it replicates the proposed theoretical structure of the original scale.

When content, convergent and construct validity are considered, this Sinhala translated questionnaire has proven to be a valid instrument to measure the psychological distress among women with miscarriage in a Sri Lankan setting.

The reliability of this Sinhala translation was assessed by two widely accepted methods, which were internal consistency and test re-test reliability.

Internal consistency was measured using Cronbach alpha by having Nunnally criteria of 0.7 as the cutoff value. All three subscales had shown good internal consistency exceeding the expected cutoff of 0.7 (0.83, 0.82, 0.78) and the whole score demonstrated a very high alpha coefficient of 0.91. These values mirror the results of

Weiss and Marmar<sup>29</sup> for the original English version of IES-R and the French validation, which also had comparable alpha coefficients ranging between 0.81 to 0.93<sup>27</sup>. Chinese validation also demonstrated similar alpha values for the respective three subscales ranging from 0.83 to 0.89<sup>28</sup>.

Very high test re-test reliability was attained in this study: Intrusion ( $r=0.97$ ), Avoidance ( $r=0.95$ ), Hyperarousal ( $r=0.96$ ), compared to the other two validation studies. Although statistically significant correlation was found for each subscale, the stability of the variables over long time was not well demonstrated here since a small sample (15 women) was retested after 2.7 days. However, Sinhala IES-R translation has shown to be a reliable measure to assess the psychological distress among Sri Lankan women with miscarriage.

### Conclusion

IES-R-Sinhala tool has shown positive correlation with GHQ. The Modified three factor model with error covariance was found to be valid. It has good internal consistency for the whole score and each subscale. Significant test re-test reliability was found for all subscales.

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