A Multi - Level Analysis on Assessment of Different Dimensions of Suicidality among Adults in Batticaloa District, Sri Lanka

Kartheepan, K[1#]

[1]Senior Lecturer in Community Medicine, Department of Primary Health Care, Faculty of Health-Care Sciences, Eastern University, Sri Lanka. (kartheepank@esn.ac.lk)

Abstract: **Background: Suicidal behaviours, ranging from suicidal ideation to suicidal acts, such as quasi-suicide, attempted suicide, and completed suicide, are very common and have reached a very wide range. In addition, this is a complex issue. Therefore, it must be investigated from multiple levels. Objective: This study focused on assessing suicidality with different dimensions among adults in the Batticaloa district of Sri Lanka (BDSL). Methodology: A cross-sectional study was carried out with 237 male and female patients of medical wards of Base Hospital, Kaluwanchikudy (BHK), from 1st January to 31st May 2019. A two-stage cluster sampling method was applied. Structured Interviewer Administered Questionnaire (SIAQ) and the Revised Suicide Behaviour Questionnaire (SBQR) are used to obtain the determinants of the various dimensions of suicide. Statistical software (SPSS 25.0) was used to analyze the data, and p-value < 0.05 was considered significant for all analyses. Descriptive statistical analysis and Multi-Level Analysis (MLA) was performed. Ethical approval was obtained from the Ethical Review Committee, Faculty of Health - Care Sciences, Eastern University, Sri Lanka. Results: 21.5% of the participants had at least one relative who attempted suicide, and almost all of them died. Few patients (6.8%) in this survey had attempted suicide and were lucky to get rid of the deadly outcome. Among these suicide attempts, the majority (73.5%) answered that their lives are vital to surviving these attempts. Variance in the total score for the suicide behaviour questionnaire is estimated as = 7.13, and the between-individual patient's variance is calculated as =2.52, and thus the total variance is 7.13 + 2.52 = 9.65. Overall mean value on the total score for suicide behaviours questionnaire across three different levels (No, definitely not, Maybe and Yes definitely) of choices of the question: would any of your problems be solved if you committed suicide? is estimated as 6.95, which was statistically significant. Conclusions: Three different levels of responses (No, definitely not, Maybe and Yes definitely) significantly varied for the scores of Suicide Behaviours Questionnaire-Revised (SBQ-R)-Overview. Overall, there was 29.4 times greater variance observed in three different choices (three different levels) for Q15 than the variance among individual patients regarding the total score for the suicide behaviour questionnaire with statistical significance.**

Keywords: **Adults, Batticaloa, Sri Lanka, Suicides, Multi-Level Analysis.**

1. INTRODUCTION

Suicidality encompasses suicidal ideation (serious thoughts about suicide), a suicide plan, and a suicide attempt. People who have suicidal ideas and a suicide plan are at a higher risk of attempting suicide, while those who have experienced various forms of suicidal thoughts and behaviours are at a higher risk of completing suicide. In adolescents, suicidal ideation has been reported as an essential risk factor for suicide and associated with a subsequent risk of attempting suicide [20]. Suicide-related behaviours are a significant public health problem, and these behaviours have increased significantly globally in recent decades. Suicide-related behaviours are complex, multidimensional events with multiple behavioural characteristics, including a series of self-injurious thoughts and behaviours to die [19]. Less obvious signs may include insomnia or changes in sleep patterns, unexplained changes in weight or appetite, changes in personality or attitude, irritability or crying, inability to concentrate or reason, sudden changes in appearance, sudden changes and Unexpected Well-being and Depression [14]. The study conducted by Johal, D.S and Sharma, M in 2016 pointed out that

the prevalence of suicidal ideation, suicide planning and suicide attempt was 14%, 9.5% and 5.9%, respectively. Considering the calculation of the estimated lethality coefficient for the variables "suicidal ideation" and "suicide attempt", it was found that the coefficient was 42.67%, which indicates concern about the behaviour that initially considered suicide because the data shows that two-fifths of teenagers think of suicide may try this action [8]. When a person cannot overcome a problem, suicidal ideation can become severe and get worse. Many reasons are related to the suicidal ideation of young people, whether they are students or professionals. It can be caused by drug abuse, academic failure, psychological disorders, poor social and family relationships, aggressive or impulsive sexual behaviour, etc. [17]. Both physical abuse and pressure to learn come from parent-child conflict, one of the most influential factors in suicidal ideation [13].

Suicidal ideation has been identified as one of the main predictors of actual suicide or attempt. It has been found that among people who have lost a partner or a child due to suicide, the risk of suicide increases. In addition, in the United States, the annual loss of productivity caused by suicide and suicide attempts amounts to $ 11.8 billion, emphasizing suicide prevention and early detection [22]. Among adults 18-25 old years, intentional self-harm (ISH) was common among men and married people. 61% of people acted impulsively; no severe mental disorders were found. The most common cause of impulsive self-injurious behaviour is an interpersonal conflict with family members, conflict with a spouse and emotional breakdown [24]. Some studies have reported significant sociocultural impacts, especially in middle and high-income families, on reports of suicide attempts, which lead to unsuccessful attempts or even suicide, which makes prevention and characterization actions difficult [21]. Hardiness theory proposes two evaluations of suicidality. Whenever threats and uncontrollable situations arise, the first assessment should be made. Therefore, the possibility of suicidal ideation increases. The second assessment involves the relationship between despair and suicidal ideation, where an upbeat assessment of the event can prevent suicide [2]. In addition, the results of suicidal ideation reflect the degree to which an individual can overcome the internal deterrence of suicidal wishes such as fear of the unknown, sabotage attempts; guilt for survivors; religious and moral opposition[1].

Suicide is a major public health problem in many countries. Every year, more than one million people die by suicide in the world [6]. As we all know, more than 50% of suicides and 20% of suicide attempts have left suicide notes. Therefore, leaving a suicide note should be considered a vital sign [3]. The results of this review indicate that in adolescents and adults, acknowledging and talking about suicide may reduce rather than increase suicidal ideation and indicate that repeated questioning may benefit long-term mental health [23]. Reducing individual suicidal ideation is the primary goal of any clinical intervention. Although the methods used in this study are psychologically sound, the multi-method approach will improve their effectiveness. In summary, the results of this study show that being assertive can reduce the adverse effects of despair on the development of suicidal ideation in Malaysian university students [2]. Prevalence of mental illness among suicides in Asian countries is lower than that in Western countries, which shows that suicide in Asian countries is not mainly understood as a sequence of such mental illnesses, but more as a response to psychosocial stress. Nevertheless, due to the significant differences in economic conditions and cultural traditions, the research results of Western countries may not be generalized to Asian countries such as Thailand [19].

Sri Lanka's suicide pledge ranks first among Southeast Asian countries. Poverty, destructive hobbies, and the inability to cope with stressful situations are the main reasons human life suddenly ends in this tragic way [12]. Throughout society, family ties affect the likelihood of suicide. Generally speaking, in many cultures, marriage is associated with a lower overall suicide rate, while divorce and separation are associated with an increased risk of suicide [16]. In recent decades, Sri Lanka has had one of the highest suicide rates in the world. Its female suicide rate is the same as in China [7]. Suicide and self-harm are concentrated in rural areas and economically disadvantaged groups. Many occur in the context of family disputes and other conflicts with close friends [7]. They are primarily unpremeditated, driven by anger, humiliation, and disappointment, and want to fight the unjust treatment [7].

Concept of suicidality is a complex issue, so it must be investigated from several levels of its dimension, such as lifetime suicide ideation and suicide attempt, frequency of suicidal ideation over the past twelve months, the threat of suicide attempt and self-reported likelihood of suicidal behaviour in the future. Sri Lanka lacks a synchronized multidimensional method of research on suicidality in adults, especially no research project conducted in the Batticaloa area. Because it is challenging to investigate suicide as an outcome, researchers often use suicidal ideas and behaviours as surrogate indicators of suicide [5]. Due to the lack of specific scientific research to determine the various dimensions of suicidality among adults residing in Batticaloa, this study focuses on assessing the suicidality with different dimensions among adults in the Batticaloa district of Sri Lanka.

2. METHODOLOGY

A. Study design

A quantitative descriptive cross-sectional study was carriedout.

B. Study area

Batticaloa district of Sri Lanka

C. Study setting

Study setting was the male and female medical wards of Base Hospital, Kaluwancikudy, Batticaloa, Sri Lanka.

D. Study period

The study period was five months (01.01.2019 to 31.05.2019)

E. Sampling method

Two-stage cluster sampling was applied. The first stage involved selecting the hospitals (Primary cluster), while the second stage dealt with the selection of wards (Secondary cluster). Therefore in the first stage, Kaluwanchikudy Base Hospital was selected as a primary cluster among three (3) Base Hospital in the Batticaloa district. In the second stage, two medical wards (Male and Female) were selected as secondary clusters among the all eligible wards in Kaluwanchikudy Base Hospital. Finally, complete enumeration was performed in selected wards.

F. Sample size

Sample size was calculated as follows: $n = Z^2_\alpha pq / (M.E)^2$ and n=size of final sampling unit, Z=confidence level of study, p=prevalence of study of interest, q=1-prevalence of study of interest, α=significance level of study and M.E=margin of error. Z=1.96, p=prevalence of suicidal ideation in Sri Lanka (literature)=0.07, q=1-prevalence=1-0.07=0.93, n= $(1.96)2*0.07*0.93/ (0.035)^2 = 3.8416*0.07*0.93/0.001225= 0.25008816/0.001225 = 204.1536$. Approximated sample size was 205. Final sample size after correction to the non-response rate was = 205+10/100*205 = 205+20.5 = 225.5 ≈ 226. The margin of error is considered as half of the prevalence since prevalence of suicidal ideation is less than 10% in the literature. As usual non response rate was considered as 10%. Therefore the final sample size was 226.

G. Study unit

Adult patients admitted in the medical wards who fit with the case definition are considered the study unit of this investigation.

H. Case definition/Operational definition

All patients who are older than 18 years old and admitted for various illnesses irrespective of their types of illness, gender, ethnicity, and religion. Suicidal ideation is defined as a desire to die or engage in destructive behaviours [11]. Suicide thinkers are individuals who currently have plans and wishes to commit suicide but have not made any recent overt suicide attempt [1]. Suicidality is an umbrella term as it includes suicidal ideation, suicide planning, and a suicide attempt that may lead to suicide [10].

I. Data collection method

Administering questionnaires by the interviewer (principal investigator) and record the information.

J. Data collection insruments

There are two instruments used. First, the Structured Interviewer Administered Questionnaire (SIAQ) with the possible determinants of suicidality was used as a data collection tool to capture the determinants associated with suicidality among adults in Batticaloa District, Sri Lanka. The second instrument was Suicide Behaviors Questionnaire-Revised (SBQ-R)-Overview-this is the straightforward scale that is used to capture the four constructs of suicidality such as lifetime suicide ideation and suicide attempt, frequency of suicidal ideation over the past twelve months, the threat of suicide attempt and the self-report likelihood of suicidal behaviour in future- this is an open-source and intensively using scale throughout the world.

K. Statistical Methods and Data Analysis Packages

Descriptive Statistics and Multi-Level Analysis (MLA) were used as the statistical analysis method of collected data. Moreover, Microsoft-Excel and Statistical Software for Social Sciences (SPSS 25.0) were used as the data analytical soft wares.

L. Ethical clearance

Ethical approval was obtained from the Ethical Review Committee, Faculty of Health-Care Sciences, Eastern University, Sri Lanka.

3. RESULTS

A. Demographic and Basic Analysis

A total of two hundred thirty-seven (237) adult participants (18 years of age or older) were recruited for this study. Most of them (51.5%) are female patients. About a quarter (24.9%) of the patients in this survey were in the age group 50 - 80 years. More patients (40.9%) had an educational level of grade-5 to GCE (O / L) level; however, few participants (1.3%) were graduates. Occupational status of the majority of the patients (55.7%) was unemployed; however, 27% of the participants were self-employed and few of them (0.8%) were government employees. 21.5% of the participants had at least one relative who attempted suicide and almost all of them died. Few patients (6.8%) in this survey had attempted suicide and were lucky to get rid of the death outcome. Among these suicide attempts, the majority of them (73.5%) answered that their lives are vital to survive these attempts.

B. Multi-Level Analysis (MLA)

Following question (Marked as Q15 in the questionnaire) treated as the predictor variable and at three mutually exclusive responses of the specific question considered as three-level for this analysis to predict the value for outcome variable (Suicide Behaviors Questionnaire-Revised (SBQ-R)-Overview = SBQR_SCORE). The question (Q15) is: Would any of your problems be solved if you committed suicide? Furthermore, the responses were: No, definitely not, Maybe and Yes definitely. In addition, MLA will evaluate the cross-level impact of these responses on different patients at a specific time and the longitudinal impact on specific patients during the period by considering daily emotional changes in the responses.

Table 1: Different types of effect in Multi-Level Analysis

Model Dimension[a]		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables
Fixed Effects	Intercept	1		1	
Random Effects	Intercept[b]	1	Variance Components	1	Q15
Residual				1	
Total		2		3	
a. Dependent Variable: SBQR_SCORE.					

A random intercepts model is a model in which intercepts are allowed to vary. Therefore, the scores on the dependent variable for each individual observation are predicted by the intercept that varies across groups. This model assumes that slopes are fixed (the same across different contexts). A fixed effects model is a statistical model in which the model parameters are fixed or non-random. This is in contrast to random effects models and mixed models in which all or part of the model parameters are random variables.

Table 2: Model fitting parameters

Information Criteria[a]	
-2 Log Likelihood	906.384
Akaike's Information Criterion (AIC)	912.384
Hurvich and Tsai's Criterion (AICC)	912.487
Bozdogan's Criterion (CAIC)	925.788
Schwarz's Bayesian Criterion (BIC)	922.788
The information criteria are displayed in smaller-is-better form.	
a. Dependent Variable: SBQR_SCORE.	

Parameters in Table-2 are used to compare different possible models and determine which one is the best fit for the data.

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Table 3: Type III tests of fixed effects

Type III Tests of Fixed Effects[a]				
Source	Numerator df	Denominator df	F	Sig.
Intercept	1	3.045	20.042	0.020
a. Dependent Variable: SBQR_SCORE.				

Type III F-test used for a time effect at the average level of condition. Type III F-tests reduce the denominator degrees of freedom with interaction and inflate the standard errors of tests of main effects for the included interaction. Significant differences were revealed for the intercept in different levels of the predictor variable.

Table 4: Estimates of fixed effects

Estimates of Fixed Effects[a]					95% Confidence Interval	
Parameter	Estimate	Std. Error	df	t	Sig.	Lower Bound	Upper Bound
Intercept	6.948690	1.552156	3.045	4.477	0.020	2.049755	11.847624
a. Dependent Variable: SBQR_SCORE.						

This table provides estimates of the fixed model effects and tests of their significance. The estimates of the effects suggest that the predictor variable (Q15) is significantly associated with the outcome variable (SBQR_SCORE). Overall mean value on the total score for suicide behaviours questionnaire across three different levels (no definitely not, maybe and yes definitely) of choices of the question: would any of your problems be solved if you committed suicide? is estimated as 6.95, which was statistically significant

Table 5: Estimates of covariance parameters

Estimates of Covariance Parameters[a]			Estimate	Std. Error
Parameter				
Residual			2.523090	0.233237
Intercept [subject = Q15]	Variance		7.130606	5.857093
a. Dependent Variable: SBQR_SCORE.				

This table provides a summary of the parameters used to specify the random effect and residual covariance matrices. The between three different choices for would any of your problems be solved if you committed suicide?. Variance in the total score for the suicide behaviour questionnaire is estimated as = 7.13, and the between-individual patient's variance (labelled 'Residual' in the output) is calculated as =2.52, and thus the total variance is 7.13+2.52=9.65.

4. DISCUSSION

Socio-economic and cultural factors related to suicidal behavior, such as the quality and quantity of mental health services, have undergone tremendous changes, so it is important to check whether the prevalence of suicidal behavior changes over time and in what way [15]. Some studies that have been conducted have provided valuable information on the prevalence and risk factors associated with suicidal ideation and attempts in the general population and adolescents [18].

Current prevalence of suicidal ideation among recruited participants is 20,700/100,000. Compared with some studies in the literature [4], this value is significantly higher, and it is numerically the same as in another study [10]. Worldwide, the lifetime prevalence of suicidal ideation is about 9.2%, and the lifetime prevalence of suicide attempts is 2.7% [2].

Most patients (55.7%) are unemployed; however, 27% are self-employed, and few (0.8%) are government workers. A strong predictor of suicide is socioeconomic disadvantage. Generally speaking, the suicide rate seems to be related to indicators of economic hardship. The suicide rate is higher in low-income areas, and the larger changes in the business cycle are related to the larger increase in the suicide rate [9]. With the complex changes in the family environment, suicide prevention must be given priority [6].

Multilevel analysis correctly explained the complex data structure, in which single-level regression underestimated the standard error. Furthermore, in the case where the aggregate analysis only examines the group level, the information about the relationships at the group level is merged, whereas the individual analysis may ignore the group or wrongly treat the group effect as an individual effect. Additionally, modeling heterogeneity, which goes beyond the typical focus on average relationships, also models variance.

Variance partition coefficient (VPC) is 7.13/9.65 = 0.74, which indicates that 74% of the variance in the total score for the suicide behaviour questionnaire can be attributed to differences between the choices (three levels) for would any of your problems be solved if you committed suicide?. 2.52% of the variance observed between individual patients, and 74% variance in three different levels (between the choices for would any of your problems be solved if you committed suicide?) concerning the total score for the suicide behaviour questionnaire were statistically significant.

5. CONCLUSION

More than half of the patients (55.7%) are economically dependent, that is, unemployed. Economic dependency and unemployment are considered the main social risk factors for suicidal ideation in the research population. Responses for the Q15 of the interviewer-administered questionnaire were significantly associated with scores for Suicide Behaviors Questionnaire-Revised (SBQ-R)-Overview, which was used to capture the four constructs of suicidality. Three different levels of responses (No, definitely not, Maybe and Yes definitely) significantly varied for the scores of Suicide Behaviors Questionnaire-Revised (SBQ-R)-Overview. Overall, there was 29.4 times greater variance observed in three different choices (three different levels) for Q15 than the variance among individual patients regarding the total score of individual patient for the suicide behaviour questionnaire with statistical significance.

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