

# Risk factors for low resilience among Grade 10 adolescents in the Gampaha district, Sri Lanka: a case-control study

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## ABSTRACT

**Objective** Resilience means the ability to deal successfully with difficult situations, and hence low resilience will lead to many negative outcomes. The aim of this study was to explore risk factors for low resilience among Grade 10 adolescents in Gampaha district, Sri Lanka.

**Methods** Resilience levels and data related to putative risk factors were obtained by using a validated 14-Item Sinhala Resilience Scale and a questionnaire on putative risk factors (both of which were self-administered) from Grade 10 adolescents by conducting a descriptive cross-sectional study. There were 464 (33.6%) cases with low resilience (score=14–73) and 916 (66.4%) controls with high resilience (score=74–98). For the case-control study, the computed sample size for each case and control group was 128, who were selected by applying simple random sampling. Risk factors for low resilience were determined using bivariate and multivariable analyses by applying  $\chi^2$  test and multivariable logistic regression. Results were expressed as ORs with respective 95% CIs.

**Results** Among the 33 putative risk factors analysed, 13 were found to be significant in bivariate analysis. In multivariable logistic regression analysis, out of 24 independent variables entered initially into the model, only 9 were retained in the final model. These comprised (1) one or both parents dead (AOR=2.5, 95% CI [1.2, 14.5]; p=0.032), (2) mother's low educational level (AOR=1.9, 95% CI [1.6, 3.8]; p=0.021), (3) sleep <8 hours (AOR=1.6, 95% CI [1.1, 3.8]; p=0.002), (4) having less than six close classmates (AOR=1.5, 95% CI [1.1, 4.3]; p=0.021), (5) not attending Sunday school (AOR=1.8, 95% CI [1.1, 10.6]; p=0.001), (6) being short-tempered (AOR=2.2, 95% CI [1.5, 3.6]; p=0.003), (7) having conflicts with friends (AOR=1.4, 95% CI [1.2, 7.5]; p=0.043), (8) not seeking help when confronted/facing with difficulties (AOR=1.6, 95% CI [1.2, 6.9]; p=0.032) and (9) lack of support from home when in need (AOR=1.6, 95% CI [1.2, 5.8]; p=0.001).

**Conclusion and recommendation** Altogether nine risk factors were identified. Interventions focusing on risk factors ascertained should be developed and conducted regularly by the schools, targeting all adolescents of Grade 10 to boost their status of resiliency.

## INTRODUCTION

Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress, such as family and relationship problems, serious

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Resilience is the process of adapting well in the face of adversity.
- ⇒ Adolescence is a transient period of life between childhood and adulthood, during which they undergo physical, mental and psychosocial changes. Boosting resilience, which is attainable through positive adjustments by addressing the risk factors, will enable adolescents to adapt to the challenges that arise from the novel experiences they encounter during this crucial period.

## WHAT THIS STUDY ADDS

- ⇒ Nine risk factors were identified from this study, of which two were nonmodifiable.
- ⇒ All factors except 'not attending Sunday school' have been reported as risk factors in the previous literature. This may be attributed to the religious culture prevailing in the country, where almost all the main religions conduct 'Sunday schools'.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Policymakers should be made aware of the urgency to introduce workshops on boosting resilience at the school level, especially for Grade 10 adolescents on a regular basis.
- ⇒ This study recommends conducting well-designed interventions, addressing the modifiable risk factors.
- ⇒ The adult population should be focused on dealing with the two nonmodifiable risk factors through health education messages and seminars, especially focusing on positive parenting skills needed for enhancing resilience among adolescents.
- ⇒ The need to conduct longitudinal studies to identify ways and means of operationalisation of resilience (as it is only a construct that is not measurable) that is agreeable to all concerned, and to identify the factors that influence trends that occur over time.



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health problems or workplace and financial stressors.<sup>1</sup> Simply, it means to 'bounce back' from difficult situations which can also bestow one with immense personal growth and development. Resilient people are not likely to consider impediments/adversities as formidable challenges, but they regard those as

valuable opportunities to boost their personal and professional skills.<sup>2</sup> Thus, resilience goes beyond the ability to cope with problems, which means leading to the ability to recover from or adjust successfully to misfortunes.

Adolescence is a transient period in life between childhood and adulthood. During this period, they experience growth spurts and the development of secondary sexual characteristics that they have never experienced before, in addition to undergoing psychological/emotional changes related to the above. Furthermore, to the aforementioned, changes related to personal identity and relationships and concerns related to educational prospects and their future are regarded as emotionally intense and stressful. All the above are further aggravated by the economic hardships that some of them have to grapple with. Thus, psychosocial adjustments are the hallmark of the novel/unusual changes experienced during this transitional period, even by healthy and typically growing adolescents.<sup>3</sup> However, failure to accomplish positive changes through psychosocial adjustments will lead them to risk-taking behaviours, such as using alcohol, tobacco and other drugs and engaging in unprotected sex<sup>4</sup> which will impose a negative impact on their lives as adolescents and adults. Therefore, it is imperative that adversities likely to affect resilience are investigated to design appropriate interventions in order to mitigate the effects of risk factors and enhance resilience.

According to Mesmen *et al*,<sup>5</sup> new theories, models, methods and challenges are surfacing in relation to resilience and its processes, from a developmental viewpoint. Accordingly, resilience has been aptly depicted as a multisystemic process of successful adaptation or recovery in the backdrop of risk or a threat. Therefore, according to Marquez *et al*,<sup>6</sup> only two main theories are specific to almost all definitions proposed on resilience, those being exposure to adversity and an indication of positive adaptation to the said adversity. In operational terms, the structure of adolescent resilience has been postulated to be the presence of developmental assets (protective factors) which moderates the association between exposure to adversity and positive outcomes. Furthermore, according to Mesman *et al*,<sup>5</sup> in addition to processes and systems of resilience at the individual, social and ecological levels, neurobiological functions such as the hypothalamic-pituitary-adrenal axis processes that mediate the biology of stress and self-regulation are also considered important.

From the Asian region, we were able to retrieve only two studies conducted on risk/protective factors related to resilience among adolescents. The investigation conducted by Banerjee *et al*<sup>7</sup> was to determine protective factors related to high resilience levels among adolescents in Kolkata, India. It was a descriptive cross-sectional study. The study participants comprised students of 7th, 8th and 9th standards of a private secondary school located in Kolkata. The number of participants was 151. The tool used was the Child and Youth Resilience Measure-12 (CYRM-12) questionnaire. Only face validity

has been assessed regarding validity, and no results related to reliability have been reported. The 'family type' (AOR=4.45, 95% CI [1.73, 11.45]); 'time spent with father' ([AOR=5.27, 95% CI [2.04, 13.6]); 'time spent with mother' (AOR=4.83, 95% CI [1.80, 12.90]) and 'physical activities' (AOR=8.14, 95% CI [2.95, 22.47]) retained its significance in the multivariable analysis.

Another descriptive cross-sectional study was conducted among Nepalese adolescents<sup>8</sup> from four secondary schools: two private and two public. The aims of the study were to describe resilience in adolescents attending the above schools in Lalitpur, Nepal, and to identify the socio-demographic characteristics of Nepalese adolescents associated with low resilience. The computed sample size was 416. An equal number of study participants were selected by applying the lottery method from Grades 9 to 12. The age range was between 13 and 19 years. The tool used was the Adolescent Resilience Questionnaire which comprises 88 items with 12 scales, covering 5 relevant ecological domains: self, family, peers, school and community. It is claimed that there was a good factor structure and reliability. Bivariate and multivariable analyses were performed to determine the risk factors. Sociodemographic factors associated with having low resilience were female gender (OR=1.73, 95% CI [1.03, 2.95]), attending a private school (OR=1.77, 95% CI [1.06, 2.98]), higher birth order compared with first born (OR=4.79, 95% CI [2.46, 9.32]), living in an urban area (OR=2.18, 95% CI [1.28, 3.71]) and being physically inactive (OR=3.0, 95% CI [1.77, 5.08]).

A recently published article<sup>6</sup> has reported a novel method referred to as 'Residuals' for determining the resilient process. Resilience has been quantified as the residual variance in relation to the outcome that remains after accounting for adversity exposure. This approach uses residue scores from regression models as a proxy for functioning/positive outcomes, which improves the ability to comprehend the resilience process. This study was conducted as a secondary analysis of the #BeeWell longitudinal dataset (n=12 130 adolescents, aged between 12 and 14 years, of Greater Manchester, England), a succession of linear regressions to establish adversity indices for later well-being, before analysing the protective effects of internal and external factors related to resilience. Home material deprivation, sexuality discrimination and bullying were the adversities identified to impact later well-being. Self-esteem, emotional regulation and optimism (internal psychological factors), physical activity and sleep (behavioural factors) and friendships and peer support (external factors) were generated as protective factors for later well-being.

There were only two studies conducted in Sri Lanka on resilience. The objective of one of these studies was to conduct a descriptive longitudinal study to determine common mental disorders and dynamics of resilience among the Tamil-speaking forced migrant Muslim population in the Puttalam district in 2011 and 2012.<sup>9</sup> The latter study was entitled 'The Common Mental

Disorders and Resilience Among Internally Displaced in Sri Lanka' (COMRAID). The 14-RS was translated into Tamil language and internal consistency was assessed both during the baseline as well as the follow-up study in addition to EFA. The internal consistency generated a Cronbach's alpha of 0.65 and 0.97, respectively, for baseline and follow-up studies. Both assessments of the Tamil version have generated a single-factor solution that aligned with that of the English version [14-RS].<sup>10</sup> Those associated with lower resilience at both stages were food insecurity, lower availability of social support and social isolation. Associations found at baseline with lower resilience were male gender and unemployment which were not present at follow-up, whereas indebtedness was associated with lower resilience at follow-up but not at baseline. This study provides evidence that resilience is not an innate trait but a dynamic process that can be situation-specific. This is not a study conducted on adolescents but on a group of displaced adults.

The objective of the second study on resilience, reported by Munasinghe,<sup>11</sup> was to adapt and validate the translated Sinhala version of the 25-item Resilience Scale. Study participants comprised 150 Sinhala conversant school children from 4 secondary schools in the Kandy district, who were aged between 14 and 18 years. The test-retest reliability conducted using Pearson's correlation resulted in a correlation coefficient ( $r$ ) of 0.92 and internal consistency (Cronbach's  $\alpha$ ) of 0.89. Concurrent validity was computed by applying Pearson's  $r$  (results not reported). Construct validity was assessed through exploratory factor analysis (EFA) which generated a six-factor solution. However, there is no mention of conducting confirmatory factor analysis to determine the relationship between observed indicators, and the factors generated from EFA.

From the account given above, it is clear that no research has been conducted on risk factors for resilience among adolescents in Sri Lanka, which is considered a major gap. Therefore, there is an urgent need to conduct research on risk factors for low resilience among adolescents to design effective, impressive and cogent interventions.

Grades 10 and 11 students (aged 15–16 years) are the ones due to attend the General Certificate of Education Ordinary Level (GCE O/L) examination, which is held when the students are in Grade 11. The preparation for the GCE O/L commences from Grade 10 and not Grade 9. Qualifying the latter examination is a prerequisite to attend the GCE A/L (Advanced Level) which is a very competitive examination, as it determines their eligibility to gain entrance to the university to pursue higher studies. Thus, the pre-examination tension leading to stress starts surfacing from Grade 10 onwards and would reach an all-time high over the subsequent 4 years or even more depending on the attempts needed to qualify the above two examinations. There are incidents where adolescents have even committed suicide due to the failure to qualify the above two nationally conducted exams. Therefore,

the interventions if required should be conducted at the level of Grade 10 to boost their resilience. The above reasons led to the decision to select Grade 10 students for this study.

The required psychosocial adjustments are attainable through building up resilience. Therefore, it is imperative that remedies are sought to help them become resilient and make them capable of bouncing back to a normal state in the face of obstacles and adversities.<sup>12</sup> An adolescent who is exposed to these stressors may become a psychologically healthy and well-adjusted individual in the presence of resilience or one who experiences psychological vulnerability due to lack of resilience.<sup>13</sup> The presence of risk factors reduces the ability to be resilient, as well as increases the likelihood of being subjected to negative outcomes.

Therefore, a large-scale study was conducted to determine three components comprising (1) prevalence (using the validated Sinhala version of the 14-Item Sinhala Resilience Scale [14-Item SRS]), (2) risk factors for low resilience and (3) the effectiveness of an intervention to boost resilience among a group of Grade 10 adolescents in the district of Gampaha. The present study reports the details of the case-control study conducted to determine the risk factors for low resilience (second component) among Grade 10 adolescents in the district of Gampaha, Sri Lanka. It is one of the 25 districts in the country, which is situated in the Western province. Classified as a mixed rural/urban area, it is the second most populous district.

## METHODS

An unmatched case-control study was conducted among Grade 10 adolescents of the state-owned schools in the district of Gampaha from January to March 2017 to determine the risk factors for low resilience.

Component 1 of the larger study consisted of a descriptive cross-sectional study,<sup>14</sup> which assessed the magnitude of resilience. The inclusion criteria comprised adolescents who were studying in Grade 10 and conversant in Sinhala. The exclusion criterion was Grade 10 adolescents in the selected schools who were suffering from a mental health disorder based on the information obtained from available diagnosis cards, parents and teachers.

There were altogether 340 schools in the Gampaha district having Grade 10 classes. Out of those, 92 schools were selected by applying systematic random sampling. From these 92 schools, a single class from each of the Grade 10 classes and each class 15 students (the minimum available number) were selected by applying simple random sampling.

Data collection was conducted using the translated 14-Item Resilience Scale (English) into Sinhala (14-Item SRS), which was subjected to factor analysis. This was a self-administered questionnaire (SAQ). Assessment of the quality of the tool demonstrated satisfactory composite reliability (in addition to Cronbach's alpha)



and construct validity in terms of convergent and divergent validity. Cases and controls were determined based on the scores obtained by individual adolescents for the above component. Cases (33.6%=464/1380) were classified as those having low resilience with a score between 14 and 73 and controls (66.4%=916/1380) as those having high resilience with a score between 74 and 98.

SAQ was developed to obtain the basic sociodemographic details and the data related to the selected putative risk factors. In addition to the thorough literature search, unstructured in-depth interviews were held with 10 Grade 10 adolescents to identify the putative risk factors. It comprised three broad components, namely, sociodemographic/personality-, family- and community-related factors. The draft questionnaire that was designed based on the above information was pretested with a group of 15 Grade 10 adolescents, which needed only minor corrections. Separate groups of adolescents were recruited for the in-depth interviews and the pretest from two schools not chosen for the main study. Subsequently face, content and consensual validity of the questionnaire were confirmed by a Delphi panel. The finalised tool was administered to the study participants along with the validated 14-Item SRS in Component 1 of the larger study.

Criteria for sample size was based on (1) least extreme OR to be detected as 2.5, (2) physical inactivity as the variable chosen, where the proportion of controls (those with high resilience) with physical inactivity was considered 20.0%, (3) power=90%, (4) alpha=5% and (5) ratio of study to control group 1:1. The relevant information reported by Singh *et al*<sup>8</sup> was the basis for the above values chosen, which were modified to suit the local situation. A sample size of 128 per group was computed using the online calculator available for sample size calculations for case-control studies (OpenEpi). The required number of study participants for the two groups was selected by applying simple random sampling to the above-mentioned two main groups of cases and controls.

Data were analysed using Statistical Package for Social Sciences (SPSS) V.22.0. Data coding and entry, search for missing data and data cleaning were done by the principal investigator. Bivariate analysis using  $\chi^2$  test was conducted to determine the significant variables among those considered putative risk factors (n=33). Multivariable logistic regression analysis was carried out to control confounding factors that would distort the point estimates, after ensuring that there was no evidence for multicollinearity between selected independent variables. All variables that were significant at <0.05 and those that had a p<0.25 in the bivariate analysis, as well as other plausible factors irrespective of p value were selected for model building. Thus, a total number of 24 independent variables became eligible to be included in the final analysis. The final model was derived using the backward stepwise method. Model fit was assessed using the Omnibus test and Wald test. A p<0.05 indicated that the model is of good fit. Results were expressed as OR with the respective 95% CI.

As the 14-Item SRS contained certain sensitive questions, the questionnaire was administered as an anonymous one. Furthermore, the confidentiality of the information was assured by informing that the completed questionnaires would be kept with the principal investigator under lock and key. In addition, the data collectors were also strictly apprised of the need to ensure confidentiality.

Written informed consent was obtained from the parents, in addition to verbal assent from the individual adolescents who were selected for Component 1 of the descriptive cross-sectional study<sup>14</sup> described earlier.

## RESULTS

The response rate was 100% (N=256), as the case-control study was an extension to Component 1 of the study as described earlier. The basic sociodemographic characteristics (sex, ethnicity and religion) were not statistically significant among cases and controls (table 1).

### Bivariate analysis

Among the 33 putative risk factors analysed, 13 were found to be significant in the bivariate analysis (table 2). They are (1) one or both parents dead, (2) living with one parent/relatives, (3) mother's low educational level, (4) sleep <8 hours, (5) having less than six close classmates, (6) sleeping as a leisure time activity, (7) not attending Sunday school, (8) lack of religious affiliations, (9) being short-tempered, (10) having conflicts with friends, (11) not seeking help when confronted/faced with difficult situations, (12) not discussing problems with parents/guardians and (13) lack of support from home.

### Multivariable analysis

Out of the 24 independent variables entered initially into the model, only 9 were retained in the final model. These comprise (1) one or both parents dead, (2) mother's low educational level, (3) sleep <8 hours, (4) having less than six close classmates, (5) not attending Sunday school, (6) being short-tempered, (7) having conflicts with friends, (8) not seeking help when confronted/faced with difficult situations and (9) lack of support from home when in need (table 3).

## DISCUSSION

There were altogether 13 variables that became significant in the bivariate analysis out of which only 9 remained significant as risk factors for low resilience, following the multivariable logistic regression analysis. Of the nine risk factors identified, two were considered nonmodifiable, namely, the living status of the parents and mother's educational level.

The loss of one or both parents is a factor that predicts low resilience. Parental death as a child is considered the hardest of all losses to bear. Bereavement resulting from the above can lead to decreased competency, depressive symptoms, low mental well-being, psychiatric disorders<sup>15</sup>

**Table 1** Association between resilience and sociodemographic characteristics of students

Sociodemographic characteristics of students	Level of resilience		P value
	Low (cases)	High (controls)	
	N=464	N=464	OR (95% CI)
	n	n	
Sex			
Males	226 (48.7%)	250 (53.9%)	p=0.12
Females	238 (51.3%)	214 (46.1%)	0.8 (0.6 to 1.1)
Ethnicity			
Sinhala	451 (97.2%)	454 (97.8%)	p=0.53
Non-Sinhala*	13 (2.8%)	10 (3.8%)	0.8 (0.3 to 1.9)
Religion			
Buddhists	399 (86.0%)	407 (87.7%)	p=0.44
Non-Buddhists†	65 (14.0%)	57 (12.3%)	0.9 (0.6 to 1.3)

\*Tamil, Muslims Burgher and Malay.

†Catholics, Christians, Hindus and Islam.

and lower chances of survival in childhood as well as adulthood.<sup>15 16</sup> The latter is due to the resultant lower economic standards they have to face<sup>16 17</sup> and lack of social support. Being resilient has been reported as having a positive impact on overcoming above-mentioned adversities, which may be achieved through coping strategies, and family and peer support.<sup>15</sup> Therefore, the affected adolescents need to be identified, counselled regularly and closely monitored in school. They should also be encouraged to find trustworthy friends, siblings and other family members who would demonstrate a sense of belonging and possess positive attitudes to support them.

According to Werner and Smith,<sup>18</sup> higher educational level of parents has been linked to good parenting qualities that lead to positive parent-child interactions, with the provision of strong emotional support and thus the capacity to build resilience. Furthermore, close parent-child relationships have the advantage of being able to inculcate other protective factors<sup>19</sup> as well. However, only mothers' low educational level was identified in the present study as a risk factor for low resilience, whereas fathers' educational level did not demonstrate an impact. Despite the above claim of the present study, a study done in Nepal<sup>8</sup> had failed to report mothers' low literacy rate being associated with low resiliency, making it an inconsistent finding. Furthermore, the study done by Banerjee *et al*<sup>7</sup> in Kolkata, India, also reports that neither fathers' nor mothers' educational level had an impact on the level of resilience among adolescents.

In addition to the inconsistencies about the role of the educational level especially of the mothers in helping to boost the resilience of adolescents, it is also a nonmodifiable factor. Despite the above limitation, it could be used as an indication to discern those adolescents of parents with low educational levels who require greater support to accomplish positive outcomes related to resilience.<sup>8</sup> This may be achieved through making use of 'parent teachers

meetings' to deliver educational inputs on parenting qualities in addition to conducting counselling sessions for both parents and adolescents.

Lack of support from home when in need was another independent risk factor identified. When faced with difficult times, which begins to grip away from one's hold, the support given by parents, siblings and other close relatives is enormous. It provides strength and courage to resolve issues without being subjected to negative outcomes. It has been stated that attachment to a primary caregiver takes place early in life around 3 years, and the inability to establish a strong relationship during that period is likely to impair long-term cognitive, social and emotional development.<sup>20</sup> Bronfenbrenner's ecological systems theory<sup>21</sup> illustrates how these adolescents are exposed to multiple environments from immediate family and school and later to society that encompasses cultural values, legal systems and mass media. Both these theories describe that the 'family' is fundamental to the normal development of adolescents. Positive aspects of parent/sibling/adolescent relationships are considered the mechanism for establishing secure attachments.<sup>22</sup> The latter leads to openness in discussing personal problems, which is a prerequisite to promote resilience among adolescents.<sup>23 24</sup> The family bonding described above needs to be enhanced through conducting parent-focused interventions, the information of which should be conveyed by the parent/s to other family members to create awareness on the value of family attachments.

Sleep <8 hours was another factor among the nine risk factors which was associated with low resilience. A study done in the US by McCuiston<sup>25</sup> on resilience and sleep quality among 167 psychology students aged 17–30 years also revealed that there was a significant correlation between high resilience and good sleep quality. According to the World Sleep Foundation,<sup>26</sup> teenagers need about 8 to 10 hours of sleep each night to function

**Table 2** Factors associated with low resilience among Grade 10 adolescents based on binary statistical analysis

No.	Significant factors	Resilience level		OR (95% CI)
		Low (cases)	High (controls)	P value
		N=128	N=128	
		n	n	
1	Parents' living status			
	Both dead	13 (10.2%)	4 (3.1%)	<b>3.5 (1.04, 15.10)</b>
	Both/one alive	115 (89.8%)	124 (96.9%)	<b>0.024</b>
2	Living with whom?			
	One parent/relatives	34 (26.6%)	20 (15.6%)	<b>1.9 (1.2, 3.8)</b>
	Both parents	94 (73.4%)	108 (84.4%)	<b>0.032</b>
3	Mother's educational level*			
	≤GCE A/L	33 (25.8%)	19 (14.8%)	<b>1.2 (1.01, 1.3)</b>
	>GCE A/L	95 (74.2%)	109 (85.2%)	<b>0.03</b>
4	Sleep duration			
	<8 hours	33 (25.8%)	18 (14.1%)	<b>2.1 (1.1, 4.3)</b>
	≥8 hours	95 (74.2%)	110 (85.9%)	<b>0.019</b>
5	Number of friends			
	1–5	28 (21.9%)	14 (10.9%)	<b>2.3 (1.1, 5.0)</b>
	≥6	100 (78.1%)	114 (89.1%)	<b>0.018</b>
6	Leisure time activities			
	Sleeping	30 (5.5%)	15 (11.7%)	<b>2.3 (1.1, 4.9)</b>
	Being active	98 (76.6%)	113 (88.3%)	<b>0.014</b>
7	Attending Sunday school			
	No	58 (45.3%)	40 (31.3%)	<b>1.8 (1.1, 3.1)</b>
	Yes	70 (54.7%)	88 (68.5%)	<b>0.021</b>
8	Religious affiliations			
	No	21 (16.4%)	9 (7.0%)	<b>2.6 (1.1, 6.7)</b>
	Yes	107 (83.6%)	119 (93.0%)	<b>0.02</b>
9	Being short-tempered			
	Yes	92 (71.9%)	75 (58.6%)	<b>1.8 (1.1, 3.2)</b>
	No	36 (28.1%)	53 (41.4%)	<b>0.026</b>
10	Having conflicts with friends			
	Often	29 (22.7%)	16 (12.5%)	<b>2.1 (1.01, 4.29)</b>
	Seldom/never	99 (77.3%)	112 (87.5%)	<b>0.033</b>
11	Measures taken when confronted/faced with difficult situations			
	Miscellaneous measures†	53 (41.4%)	34 (26.6%)	<b>1.9 (1.1, 3.4)</b>
	Discuss/obtain help from others	75 (58.6%)	94 (73.4%)	<b>0.012</b>
12	Discusses problems with parents/guardians			
	No	31 (24.2%)	14 (10.9%)	<b>2.6 (1.3, 5.6)</b>
	Yes	97 (75.8%)	114 (89.1%)	<b>0.005</b>
13.	Lack of support from home when in need			
	No	46 (35.9%)	28 (21.9%)	<b>2.0 (1.1, 3.6)</b>
	Yes	82 (64.1%)	100 (78.1%)	<b>0.013</b>

Bold font indicates variables where the range of 95% CI was ≤4.

\*General Certificate of Examination, Advanced Level.

†Cry and forget, cry and think later, eat more than usual, attending to religious activities, meditate, wait and see and face alone.

optimally. However, a large proportion (85%) of them in the world are reported to be deprived of quality sleep. Sleep deprivation can impair the ability to hold sustained

attention, and the shorter the sleep opportunity, the poorer the ability to sustain attention throughout the day.<sup>27</sup> Furthermore, sleep deprivation can result in being

**Table 3** Risk factors for low resilience among Grade 10 adolescents in the final model

No.	Risk factors	Adjusted OR	95% CI	P value
<b>N=128 per group</b>				
1	Parents' living status			
	One or both parents dead	2.5	1.2 to 14.5	<b>0.032</b>
	Both parents alive	1.0		
2	Mother's educational level			
	≤GCE A/L*	1.9	1.6 to 3.8	<b>0.021</b>
	>GCE A/L	1.0		
3	Sleep duration			
	<8 hours	1.6	1.1 to 3.8	<b>0.002</b>
	≥8 hours	1.0		
4	Number of friends			
	1–5	1.5	1.1 to 4.3	<b>0.021</b>
	≥6	1.0		
5	Attending Sunday school			
	No	1.8	1.1 to 10.6	<b>0.001</b>
	Yes	1.0		
6	Being short-tempered			
	Yes	2.2	1.5 to 3.6	<b>0.003</b>
	No	1.0		
7	Having conflicts with friends			
	Often	1.4	1.2 to 7.5	<b>0.043</b>
	Seldom/never	1.0		
8	Measures taken when confronted/faced with difficult situations			
	Miscellaneous measures†	1.6	1.2 to 6.9	<b>0.032</b>
	Discuss/get help from others	1.0		
9	Lack of support from home when in need			
	No	1.7	1.2 to 5.8	<b>0.001</b>
	Yes	1.0		

Bold font indicates variables where the range of 95% CI was ≤4.

\*General Certificate of Examination, Advanced Level.

†Cry and forget, cry and think later, eat more than usual, attending to religious activities, meditate, wait and see and face alone.

short-tempered, which is another independent risk factor for resilience that emerged from this study.

Another factor that leads to sleep deprivation is over or inappropriate use of social media and internet by adolescents through breaking rest. In addition, the content consumed is likely to cause emotional distress and maladaptive behaviours, which exerts a negative impact on boosting resilience. Contrary to the above, it is also well known that digital platforms promote social inclusion/interaction that exerts a positive impact on resilience.<sup>28</sup> Thus, it is the responsibility of the parents to impose restrictions and regulate times for using digital platforms. Furthermore, parent-targeted interventions should also address the importance of quality sleep that the adolescents need in addition to good parenting qualities if they are to perform well in their studies as well as grow up to be reputable citizens. To mitigate the negative

impacts of misuse of digital platforms, it is also imperative to design interventions targeting adolescents based on the type of content (eg, educational aspects) they should select to watch and on the need to restrict the time spent on digital platforms.

The variable of having less than six close classmates was also identified as independently imposing a significant negative impact on an individual's resilience levels. Having close friends means having connections where two or more people interact with each other and each person feels valued, with a sense of belonging. Being connected and having a close relationship with compassionate, empathetic and trustworthy persons whom one could confide in is critical for one's physical health and mental well-being.<sup>22 29 30</sup> Connectedness may even provide the person with insight/new ideas to better manage the challenges that one faces. Therefore, it is important that

adolescent-focused interventions should address the need for being connected and the ways and means of building friendships such as being kind, genuine, devoting time and showing appreciation.

Being short-tempered was also identified as a risk factor for low resilience as stated above. Anger is an uncontrollable emotion which is accompanied by biological, physiological and psychological changes, which are likely to affect the overall quality of life and lead to interpersonal conflicts and career challenges. The remedies for the above include coping mechanisms and identifying outlets for anger.<sup>31</sup> Inclusion of training programmes on cognitive regulation and emotion management strategies has been recommended by Mestre *et al.*<sup>32</sup> Hence, it is important that the interventions are designed to build up anger management skills, including cognitive behavioural therapy which is currently considered the best treatment modality.<sup>33</sup>

Although being connected to friends and peers has a major role in enhancing resilience, the tendency to have frequent conflicts between them leading to relationship difficulties also emerged as one of the risk factors in the present study. Conflicts are considered an integral part of life, as there are differing views between two people, as well as misinterpretations related to what has been stated by a colleague. Therefore, what is important is developing the skills required to resolve those issues amicably by agreeing to disagree. Peer conflict can also lead to emotional distress and physical harm through resorting to aggressive behaviours. Therefore, the adolescent-focused interventions should also include the strategies available to resolve conflicts (positive peer-conflict resolution techniques),<sup>34 35</sup> in addition to anger management techniques described above.

Keeping problems to oneself and refraining from obtaining help or engaging in discussions when faced with difficulties also surfaced as independent risk factors from the present study. When confronted with problems, one becomes overwhelmed with stress and it is important to reach out for effective coping strategies that will help one to be calmed down.<sup>36</sup> Therefore, it is important to seek support, which may be from the family or from a solid network of supportive people and trustworthy friends, with whom intimate relationships and attachments have been established.<sup>37</sup> Simply relating a difficult situation to a family member or a close friend may not resolve issues instantly, but it will allow one to share his/her feelings which may result in a substantial amount of relief, get support and positive feedback or even receive suggestions to overcome the problem. Thus, getting help from trustworthy, caring person/s is fundamental to resolving problems faced by individuals, which should be promoted among adolescents through the interventions conducted.

The variable of not attending Sunday school was the last to emerge as a risk factor for low resilience. In Sri Lanka, almost all the main religions conduct Sunday schools, which are meant to promote religious education

thus playing a significant role in instilling moral and ethical principles in the minds of children, which may be considered the foundation for being religiously affiliated. Attending Sunday school by itself may not make them religious. Family background with religious commitments and religious upbringing also plays a major role in an individual to embrace the religion which will mould and enrich the overall functioning, instilling values of self-control and social competence.<sup>38</sup> Although religious affiliation emerged as a significant factor in the bivariate analysis, it failed to be included in the final model, possibly due to it being a confounding factor. A positive association between religiosity and resilience was revealed in a meta-analysis<sup>39</sup> and among academic students in Iran.<sup>40</sup> Similar results have emerged from a qualitative study conducted among eight Iranian adolescents, which highlighted the importance of having faith in God.<sup>41</sup> The positive association has also been asserted by Pargament and Cummings,<sup>42</sup> who have demonstrated the importance of incorporating religious resources into interventions designed for enhancing resilience.

Therefore, as a remedial measure, it may be necessary for the parents to send their children to Sunday schools from their childhood, irrespective of the religion they belong to. Hence, the need to foster religiousness through interventions conducted for adolescents and family members is highlighted. All religions preach and inculcate positive thoughts and attitudes in the minds of individuals, which should be initiated from childhood as it is essential to create well-balanced persons in society.

Although biological sex has been identified as a risk factor by certain studies,<sup>8</sup> it did not emerge as significant in the present study. In addition, those with higher birth order (third onwards) were reported to be four times the odds of having low resilience among adolescents in comparison to the first born in the Nepal study.<sup>8</sup> However, this variable in the present study did not reach statistical significance either in the bivariate or the multi-variable logistic regression analysis. Important variables like family type (such as nuclear/extended families and single-parent families)<sup>7</sup> which were not included in the present study are considered limitations. Furthermore, 'physical inactivity' was embedded in the variable 'extra-curricular activities', which dilutes its importance of being a strong risk factor. As a future direction, the inclusion of the above three variables as separate putative risk factors is recommended.

Although the prevalence study (Component 1 of the larger study) recruited a large sample size of 1380, for the case-control study, the computed sample size was 128 per group. The need to stick to the latter had two main reasons. Having an additional number of study participants means the need for extra financial and human resources, which amounts to unnecessary expenditure and can be considered unethical. However, this does not apply to the present study, as data for the prevalence of low resilience and risk factors for the same were obtained together with no additional costs. The second



is a statistical issue. When the sample size increases, the power of the study is enhanced. Therefore, the tendency is to reject null hypothesis with clinically irrelevant differences, leading to those statistically insignificant associations to be observed as significant.<sup>43 44</sup>

There was no possibility for nonresponse bias and volunteering (selection biases) to occur in relation to the present study, as the selection was based on the study population chosen for the descriptive cross-sectional study conducted for determining the magnitude of resilience.<sup>14</sup> Recall bias is a bias specific to case-control studies, which is due to differential recall of past exposures when the study participants are aware of their outcome status.<sup>44</sup> In the present study, none of the participants were aware of their resilience levels, and hence there was no possibility for recall bias to exert a negative impact on the point estimates.

For the control of confounding, unconditional logistic regression (ULR) was applied which generated a model of nine risk factors. However, as this is a study in which all the study participants were almost of the same age, what is conventionally adopted for the analysis of matched studies is the application of conditional logistic regression (CLR). However, according to Pearce<sup>45</sup> and Schlesselman,<sup>46</sup> applying standard/ULR analysis for control of matching factors can be achieved without loss of validity and with the advantage of better statistical precision under certain situations. One such instance, as suggested by Pearce,<sup>45</sup> is when the number of participants per stratum is high, such as when matching is conducted for one binary factor (age and sex), where application of ULR yields a greater precision in comparison with CLR. The above account justifies us resorting to ULR analysis, as the only matching factor for the present study was age.

In view of the fact that the common biases likely to affect the study results have been diligently evaluated and addressed, it may be concluded that a satisfactory level of internal validity has been achieved. This is another strength of the study.

This was a study conducted in 1 out of 25 districts in Sri Lanka, applying probability sampling techniques through all the stages of selecting the final sample of the descriptive as well as the case-control study. Hence, the results may be applied to all Grade 10 adolescents in the said district. However, as those having physical and mental disabilities have been excluded from the initial study,<sup>14</sup> the risk factors determined can only be extrapolated to those who were free of physical and mental disabilities which is another limitation of the study.

## CONCLUSIONS

Nine risk factors were identified from this case-control study, of which two were nonmodifiable. It is important to plan and develop interventions focusing on the risk factors identified which should be conducted on a regular basis at the school level, targeting all adolescents of Grade 10 to boost their status of resiliency. It is

also imperative to garner the support of parental/family members, when relevant. In future research, it is recommended to conduct the magnitude of resilience and the risk factors for low resilience among Grade 5 (10 years of age) students to plan and conduct interventions. The latter is of substantial importance, as this is the crucial age at which they commence experiencing the difficult physical, psychological and social changes that occur during the transitional period of childhood to adulthood.

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