Association of adverse childhood experiences with functional identity and impulsivity among adults: a cross-sectional study [version 2; peer review: 2 approved, 1 approved with reservations]

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Abstract

Introduction: The present study explores the association of adverse childhood experiences with impulsivity and functional identity among Pakistani adults.

Methods: In this cross-sectional study, 260 Pakistani medical students aged 18 and above were approached. A consent form, a questionnaire on sociodemographic characteristics, and an English versions of the Adverse Childhood Experiences (ACE) scale, Functions of Identity scale (FIS) and Barratt’s Impulsiveness Scale (BIS-11) was employed in this study. All data were analyzed in SPSS v. 20.

Results: A total of 122 (52.6%) of respondents had experienced at least one adverse childhood experience. Verbal, physical, sexual adverse events and poor support and affection from family were the most reported adverse events. ACE scores yielded a significantly positive association with cognitive stability, perseverance and motor impulsivity on the Barratt’s impulsivity scale. Whereas, it yielded negative association with structure and harmony subscales of the functional identity as well as cognitive complexity subscale of the impulsivity scale.

Conclusions: A high proportion of Pakistani medical students reported adverse childhood experiences, which lead to impulsive behaviors and poor functional identities.

Keywords
adverse childhood, impulsivity, identity, Pakistan, abuse
Corresponding author: Ahmed Waqas (ahmedwaqas1990@hotmail.com)

Author roles: Haaris Sheikh M: Conceptualization, Data Curation, Formal Analysis, Supervision, Validation, Writing – Review & Editing; Naveed S: Conceptualization, Data Curation, Formal Analysis, Supervision, Writing – Review & Editing; Waqas A: Conceptualization, Data Curation, Formal Analysis, Supervision, Validation, Writing – Review & Editing; Tahir Jaura I: Data Curation, Formal Analysis, Writing – Original Draft Preparation

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

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Introduction

The Centers for Disease Control and Prevention (CDC) report a high prevalence of physical (28%) and sexual abuse (21%) associated with an unstable living environment among the American youth. Previous studies demonstrate a significant relationship between experience of abuse and physical, behavioral, and social problems among the youth. Although there is abundant data exploring the prevalence of adverse childhood experiences in higher income countries, in low and middle income countries (LAMI) data is more scarce. Moreover, a paucity of data has been identified in the LAMI, necessitating the need to transculturally translate the impact of adverse childhood events (ACEs) on social, cognitive, and emotional impairment and adoption of high risk behaviors.

Childhood emotional mistreatment; particularly emotionally abusive acts, has been found to be associated with increased odds of lifetime diagnoses of several mental disorders. The early, prolonged, and severe trauma can also increase impulsivity, diminishing the capacity of the brain to regulate emotions. Neurobiological studies show that childhood mistreatment leads to failure of inhibitory processes ruled by the frontal cortex over a fear-motivated hyper-responsive limbic system. Therefore, impulsivity is a double-edged sword, presenting itself as a sequel of trauma as well as a risk factor for the development of a pathological response to trauma. Many psychiatric disorders feature impulsivity, including substance-abuse disorders, attention deficit hyperactivity disorder, borderline personality disorder, conduct disorder and mood disorders. Impulsivity has also been associated with suicidal behaviors within various psychiatric populations exhibiting low serotonergic activity. In mental health disorders especially substance use disorders, superimposition of the behavioral aftermaths of ACEs on impulsivity potentiate the risk of alcohol abuse by many folds.

Similarly, previous studies have also established an association between ACEs and development of identity in adolescence. Development of a stable identity is a major developmental task, with its changing facets responsible for shaping the attachment styles and self-esteem in adolescence. Serafini and Adams describe the importance of identity in providing structure for higher self-esteem and positive self-image; providing the goals necessary for self-direction. This provides a sense of free will; harmony for social and academic adjustment; and future orientation that manifests as achievements in academia, aspirations and determination. To address the gaps in scientific literature, this present study explores the association of adverse childhood experiences with demographics, subsequent impulsivity and functional identity among Pakistani adults.

Methods

This study was designed as a cross-sectional study, where 260 medical students aged 18 and above and currently enrolled in King Edward Medical University and CMH Lahore Medical College & Institute of Dentistry, both in Lahore, were conveniently interviewed from April to May, 2017. Institutional review board approval was sought and obtained from the Ethical Review Board of CMH Lahore Medical College, Pakistan (approval number: 21/ERC/CMHLMC). A consent form, an anonymous questionnaire on sociodemographic characteristics, and English versions of the Adverse Childhood Experiences (ACE) scale, Functions of Identity scale (FIS) and Barratt’s Impulsiveness Scale (BIS-11) were employed in this study. Participation in this study was voluntary and written informed consent was obtained from all participants. The participants were ensured anonymity and that only group findings would be reported.

The Adverse Childhood Experiences (ACE) questionnaire is an important assessment tool that measures multiple types of abuse and adverse experiences that one may have encountered as a child. It assesses adverse childhood experiences related to abuse (physical, psychological and sexual); neglect (emotional and physical) and household dysfunction (alcoholism or drug use at home, loss of biological parent, mental illness in home, violent treatment by mother and imprisoned household member). Responses to the ACE are recorded on a dichotomous scale (yes/no) and then scores are summed with higher scores corresponding to a higher number of ACEs. It has exhibited adequate reliability (Cronbach’s alpha 0.6 to 0.8) and validity in previous study.

The Functions of Identity Scale (FIS) is a valid and reliable 5-point Likert scale, comprising 15 questions that assess five domains of psychological functions that identity serves for an individual: structure, goals, personal control, harmony and future. Higher scores on these subscales correspond to a stronger sense of identity.

Barratt’s Impulsiveness Scale (BIS-11) is a 30-item self-report Likert scale, with seven subscales: attention, motor, self-control, cognitive complexity, perseverance, and cognitive instability. Higher scores on the scale or its subscales correspond to worsening impulsivity. All of these scales were found to be reliable in the present sample with following Cronbach’s α: ACE (0.71), FIS (0.86) and BIS-11 (0.78).

All data were analyzed in SPSS v. 21. Descriptive statistics were computed for the whole data. Frequencies were calculated and reported for ten domains of ACE, impulsivity and functions of identity. Partial correlations were run to assess the association of impulsivity and functions of identity with ACEs, adjusting for gender, age and socioeconomic status.

Results

A total of 232 medical students (232/260= 89.2%) responded to the surveys. The majority of them were females (n=188, 81%), with a mean age of 21.22 ± 1.31 years, mean number of siblings 3 ± 1.46, mean order of birth 1.94 ± 0.78 and a mean income greater than 30,000 PKR (n=208, 89.7%). Mean scores on subscales of Functional Identity Scale and Barratt’s Impulsiveness Scale are given in Table 1.
Mean score (SD) on the ACE scale was 1.37 (1.75). A total of 122 (52.6%) respondents had experienced at least one ACE. Verbal, physical, sexual adverse events and poor support and affection from family were the most reported adverse events. A significant proportion of respondents cited verbal (34.5%), physical (22.0%) and sexual abuse (15.5%), poor family support (19.0%), neglect (9.9%), separation/divorce of parents (4.7%), and witnessed domestic abuse (11.2%), substance abuse (3.9%), mentally or suicidal patient in the family (11.2%) and criminal background (4.7%). Detailed statistics are presented in Table 2.

Table 1. Mean scores on subscales of the Functional Identity Scale.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Identity Scale</td>
<td>11.14</td>
<td>2.5</td>
</tr>
<tr>
<td>Structure</td>
<td>12.27</td>
<td>2.3</td>
</tr>
<tr>
<td>Harmony</td>
<td>11.59</td>
<td>2.6</td>
</tr>
<tr>
<td>Goals</td>
<td>11.00</td>
<td>3.0</td>
</tr>
<tr>
<td>Future</td>
<td>11.78</td>
<td>2.1</td>
</tr>
<tr>
<td>Personal Control</td>
<td>11.88</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Barrat's Impulsiveness Scale

| Attention                  | 11.46| 2.9            |
| Cognitive instability      | 7.47 | 2.1            |
| Motor                     | 16.50| 3.9            |
| Perseverance               | 7.57 | 2.0            |
| Self-control               | 13.13| 3.4            |
| Cognitive complexity       | 12.14| 2.6            |
| Attention                  | 18.93| 3.9            |
| Motor                     | 24.08| 4.8            |
| Non-planning               | 25.27| 4.9            |

Table 2. Adverse childhood experiences reported by respondents.

<table>
<thead>
<tr>
<th>Adverse childhood experiences</th>
<th>Response</th>
<th>Count</th>
<th>Column N %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did a parent or other adult in the household often? Swear at you, insult you, put you down, or humiliates you? or Act in a way that made you afraid that you might be physically hurt?</td>
<td>No</td>
<td>152</td>
<td>65.5%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>80</td>
<td>34.5%</td>
</tr>
<tr>
<td>Did a parent or other adult in the household often: Push, grab, slap, or throw something at you? or Ever hit you so hard that you had marks or were injured?</td>
<td>No</td>
<td>181</td>
<td>78.0%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>51</td>
<td>22.0%</td>
</tr>
<tr>
<td>Did an adult or person at least 5 years older than you ever: Touch or fondle you or have you touch their body in a sexual way? or Try to or actually have oral, anal, or vaginal sex with you?</td>
<td>No</td>
<td>196</td>
<td>84.5%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>36</td>
<td>15.5%</td>
</tr>
<tr>
<td>Did you often feel that no one in your family loved you or thought you were important or special? or Your family didn’t look out for each other, feel close to each other, or support each other?</td>
<td>No</td>
<td>188</td>
<td>81.0%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>44</td>
<td>19.0%</td>
</tr>
<tr>
<td>Did you often feel that you didn’t have enough to eat, had to wear dirty clothes, and had no one to protect you? or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?</td>
<td>No</td>
<td>209</td>
<td>90.1%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>23</td>
<td>9.9%</td>
</tr>
<tr>
<td>Were your parents ever separated or divorced?</td>
<td>No</td>
<td>221</td>
<td>95.3%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>11</td>
<td>4.7%</td>
</tr>
<tr>
<td>Was your mother or stepmother: Often pushed, grabbed, slapped, or had something thrown at her? or Sometimes or often kicked, bitten, hit with a fist, or hit with something hard? or Ever repeatedly hit over at least a few minutes, or threatened?</td>
<td>No</td>
<td>206</td>
<td>88.8%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>26</td>
<td>11.2%</td>
</tr>
<tr>
<td>Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?</td>
<td>No</td>
<td>223</td>
<td>96.1%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>9</td>
<td>3.9%</td>
</tr>
<tr>
<td>Was a household member depressed or mentally ill or did a household member attempt suicide?</td>
<td>No</td>
<td>206</td>
<td>88.8%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>26</td>
<td>11.2%</td>
</tr>
<tr>
<td>Did a household member go to prison?</td>
<td>No</td>
<td>221</td>
<td>95.3%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>11</td>
<td>4.7%</td>
</tr>
</tbody>
</table>
ACE scores yielded a significantly positive association with cognitive stability, perseverance and motor impulsivity on the Barrat’s impulsivity scale. Whereas, it yielded negative association with structure and harmony subscales of the functional identity as well as cognitive complexity subscale of the impulsivity scale. Detailed statistics are presented in Table 3. Moreover, no significant correlation was found with gender (P= 0.07), number of siblings (P= 0.95) and order in birth (P=0.08) and household income (P= 0.21). Age of participants was positively associated with ACE scores (r= 0.15, P= 0.02).

Table 3. Association of ACE scores with subscales of impulsivity and functional identity (n=223).

<table>
<thead>
<tr>
<th>Variable</th>
<th>r*</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulsivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>0.038</td>
<td>0.575</td>
</tr>
<tr>
<td>Cognitive stability</td>
<td>0.133</td>
<td>0.046</td>
</tr>
<tr>
<td>Perseverance</td>
<td>0.145</td>
<td>0.029</td>
</tr>
<tr>
<td>Self-control</td>
<td>0.008</td>
<td>0.901</td>
</tr>
<tr>
<td>Cog complx</td>
<td>-0.227</td>
<td>0.001</td>
</tr>
<tr>
<td>Attention</td>
<td>0.101</td>
<td>0.130</td>
</tr>
<tr>
<td>Motor</td>
<td>0.151</td>
<td>0.024</td>
</tr>
<tr>
<td>Non-planning</td>
<td>-0.115</td>
<td>0.085</td>
</tr>
<tr>
<td>Functional identity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>-0.219</td>
<td>0.001</td>
</tr>
<tr>
<td>Harmony</td>
<td>-0.169</td>
<td>0.011</td>
</tr>
<tr>
<td>Goals</td>
<td>-0.012</td>
<td>0.855</td>
</tr>
<tr>
<td>Future</td>
<td>0.005</td>
<td>0.941</td>
</tr>
<tr>
<td>Personal control</td>
<td>-0.060</td>
<td>0.374</td>
</tr>
</tbody>
</table>

*Controlled for gender, age, year of study, number of siblings and order in birth

Conclusion
In our study, adverse childhood experiences were significantly negatively associated with structure and harmony subscales of the functional identity scale. Providing structure is a major function of one’s identity, deprivation of this results in poor self-esteem and negative self-image. These adverse experiences may provide a better orientation in adulthood to fulfill one’s potential in academics and career in adulthood.

Individuals reporting higher episodes of ACEs reported higher impulsivity, translating to a greater motor impulsiveness and a disrupted executive functioning among these individuals.

The results of this study should be generalized with caution. The cross-sectional nature of this study does not establish causality and temporality, therefore, future studies should employ a longitudinal study design.

Data availability
Dataset 1: Impulsivity and adverse childhood events. The dataset contains all variables pertaining to demographics, responses to Functional Identity Scale and Barrat’s Impulsiveness Scale. DOI, 10.5256/f1000research.13007.d182670.

Consent
Participation in this study was voluntary and written informed consent was obtained from all participants. The participants were ensured anonymity and that only group findings would be reported.

Competing interests
No competing interests were disclosed.

Grant information
The author(s) declared that no grants were involved in supporting this work.

References


Open Peer Review

Current Peer Review Status: ✔️ 💡 ✔️

Version 2

Reviewer Report 29 August 2018

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Muhammad Shahzeb Khan
Department of Internal Medicine, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL, USA

The article addresses an important issue especially among the Pakistani Population. Considering its a short report, the authors have done a good job in their literature review. However as I am not an expert in this field, cannot comment on the technicalities and intrinsic details of the subject matter. The methods and analysis seem appropriate. In the abstract results section, it will be better to provide numbers, percentages where they talk about frequency of adverse events. In the abstract methods, they should state which analysis they ran.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Data Analysis, Data Interpretation, Bibliographic Analysis, Meta-Analysis and Systematic Reviews
I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 02 July 2018

https://doi.org/10.5256/f1000research.16311.r34188

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Syeda Fariha Iram Rizvi
Institute of Applied Psychology, University of the Punjab, Lahore, Pakistan

The article is improved, but still I have one problem - you have used one nominal scale with yes/no and two are ordinal scales. In this case you can't compute Pearson correlation. I think you have to use chi square and logistic regression. I would suggest to consult any statistics expert.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: child abuse, child and adolescent psychopathologies and problem behaviors, family relationships

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.
Ahmed Waqas, CMH Lahore Medical College & Institute of Dentistry, Lahore Cantt, Pakistan

Dear Dr. Rizvi,

My co-authors and I are very grateful to you for your feedback. We had used total scores on the Adverse Childhood Experiences (ACE) scale, Functions of Identity scale (FIS) and Barratt’s Impulsiveness Scale (BIS-11). Therefore, these were measured as continuous variables (scale) rather than ordinal or dichotomous. Hence, use of partial correlations is justified in this case.

We would be grateful if you could please reconsider your decision in light of our response.

Best wishes,

Dr. Ahmed Waqas
Corresponding author

Competing Interests: The authors declare that they have no conflict of interest.
predictors/independent variables although according to title and literature ACE are predictors and impulsivity and identity related variables are outcome variables. So according to the purpose of research results are wrong. If author has something else in mind please explain it.

If author will mention objectives and hypotheses and then give analyses according to hypotheses then reader can understand what actually author want to explore.

Discussion is poorly written. please relate your results with existing literature

Is the work clearly and accurately presented and does it cite the current literature?  
Partly

Is the study design appropriate and is the work technically sound?  
Partly

Are sufficient details of methods and analysis provided to allow replication by others?  
No

If applicable, is the statistical analysis and its interpretation appropriate?  
No

Are all the source data underlying the results available to ensure full reproducibility?  
Partly

Are the conclusions drawn adequately supported by the results?  
Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** child abuse, child and adolescent psychopathologies and problem behaviors, family relationships

I have read this submission. I believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

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**Author Response 12 May 2018**

**Ahmed Waqas**, CMH Lahore Medical College & Institute of Dentistry, Lahore Cantt, Pakistan

**Response to Reviewer:**
Dear Ms. Rizvi,

We are grateful to you for providing such a valuable feedback to our short report exploring the association of adverse childhood experiences with functional identity and impulsivity among adults. We have updated our manuscript in line with your comments, and firmly believe that it has improved the quality of our manuscript.

We hope for your favorable response in due time.

Best wishes,

Dr. Ahmed Waqas

Corresponding author
Comment 1:
Explain sub-variables in ACE in terms of questions. Is every single question of ACE a separate variable?
Response 1:
We are grateful to you for your feedback. We have expanded the methodology section with details on ACE questionnaire. It now reads as:
“The Adverse Childhood Experiences (ACE) questionnaire is an important assessment tool that measures multiple types of abuse and adverse experiences that one may have encountered as a child. It assesses adverse childhood experiences related to abuse (physical, psychological and sexual); neglect (emotional and physical) and household dysfunction (alcoholism or drug use at home, loss of biological parent, mental illness in home, violent treatment by mother and imprisoned household member). Responses to the ACE are recorded on a dichotomous scale (yes/no) and then scores are summed with higher scores corresponding to a higher number of ACEs. It has exhibited adequate reliability (Cronbach's alpha 0.6 to 0.8) and validity in previous study.”

Comment 2:
how can we say that if a person say yes to a single question that means he or she had a adverse childhood experience? Only Frequency and severity of an experience can determine its intensity.
Response 2:
The Adverse Childhood Experiences scale is one of the most widely used scales globally. It has demonstrated adequate factor validity as well as reliability in previous studies. Based on these merits, we had opted to use this scale in our setting. Furthermore, it also yielded an acceptable reliability (alpha= 0.71) in our study.
Please, also see:

Comment 3:
Literature review is poor. Objectives and hypotheses are not mentioned in article.
Response 3:
We partly agree with your comment. But please, do understand that our manuscript is a short report, bound by a word limit of 1000 words excluding tables and references. Due to constraints of word count, we had provided a summary of the recent literature. And therefore, could not expand the introduction section, which has a word count exceeding 1200 at present. We have updated our introduction with objectives of the study. It reads as:
“To address the gaps in scientific literature, the present study explores the association of adverse childhood experiences with demographics, subsequent impulsivity and functional identity among Pakistani adults.”

Comment 4:
I have serious concerns regarding result/analysis section. Relationship should be analysed with correlational analysis first and then go for regression analysis to confirm the relation while
identifying significant predictors. Analysis is very much confused as I can’t understand that what variables are described as predictors and which one are outcome variables. According to Table no3 impulsivity and identity are described as predictors/independent variables although according to title and literature ACE are predictors and impulsivity and identity related variables are outcome variables. So according to the purpose of research results are wrong. If author has something else in mind please explain it.
If author will mention objectives and hypotheses and then give analyses according to hypotheses then reader can understand what actually author want to explore.
Response 4:
Dear Ms. Rizvi, thank you so much for your guidance. We have updated our results with new analyses providing mean scores of ACE scale (representing severity of adverse experiences) and frequency of individual types of ACEs. We have also replaced regression analysis with partial correlations adjusted for gender, age, year of study, number of siblings and order in birth.
The results section now reads:
Mean score (SD) on the ACE scale was 1.37 (1.75). A significant proportion of respondents cited verbal abuse (34.5%), physical (22.0%), sexual (15.5%), poor family support (19.0%), neglect (9.9%), separation/divorce of parents (4.7%), and witnessed domestic abuse (11.2%), substance abuse (3.9%), mentally or suicidal patient in the family (11.2%) and criminal background (4.7%).
ACE scores yielded a significantly positive association with cognitive stability, perseverance and motor impulsivity on the Barrat’s impulsivity scale. Whereas, it yielded negative association with structure and harmony subscales of the functional identity as well as cognitive complexity subscale of the impulsivity scale. Moreover, no significant correlation was found with gender (P= 0.07), number of siblings (P= 0.95) and order in birth (P=0.08) and household income (P= 0.21). Age of participants was positively associated with ACE scores (r= 0.15, P= 0.02).

Comment 5:
Discussion is poorly written. please relate your results with existing literature
Response 5:
We agree with your comment. But please, do understand that our manuscript is a short report, bound by a word limit of 1000 words excluding tables and references. Therefore, we have replaced our discussion section with conclusion and limitations.

**Competing Interests:** We do not have any competing or financial conflicts of interest.
In Pakistan, the researchers often have to deal with scarcity of existent data on virtually any subject. This article gives insight about adverse childhood experiences and its impact in terms of functional identity and impulsivity. However, there are a few points to be addressed.

First, the title states, Association of adverse childhood experiences with functional identity and impulsivity among adults; a cross sectional study. However, the study population consists of medical students from early adulthood. This should be reflected in the title.

Secondly, the religious and culturally constrained environment is different from other low and middle income countries. Hence, whenever a study in social sciences is conducted prior validity of used questionnaire should be established, which was not done in this study.

Furthermore, in the conclusion the authors have stated a 'high' proportion of subjects who suffered from adverse childhood experiences. What were the control cut off values for high vs low proportion in this regard.

**Is the work clearly and accurately presented and does it cite the current literature?**
Partly

**Is the study design appropriate and is the work technically sound?**
Partly

**Are sufficient details of methods and analysis provided to allow replication by others?**
Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**
I cannot comment. A qualified statistician is required.

**Are all the source data underlying the results available to ensure full reproducibility?**
Yes

**Are the conclusions drawn adequately supported by the results?**
Yes

**Competing Interests:** No competing interests were disclosed.

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