

A Systematic Review and Meta-Epidemiological Analysis of Post-Traumatic Stress Disorder Prevalence among Adolescents: an update

Silky Arora¹, Sujata Satapathy²

¹Research Associate, Department of Psychiatry, All India Institute of Medical Science, New Delhi, India

²Professor (Clinical Psychology), Department of Psychiatry, All India Institute of Medical Science, New Delhi, India

Corresponding author: Sujata Satapathy

Email – sujatasatapathy2022@gmail.com

ABSTRACT

Background: With increased vulnerability to traumatic incidents the risk of PTSD and comorbid mental illnesses also multi-fold during adolescence. We conducted a meta-epidemiological analysis of systematic reviews (SR)/meta-analysis (MA) to identify and address gaps and a meta-analysis of original epidemiological studies for PTSD prevalence among adolescents.

Methodology: Search period (Jan 1991-Nov 2023) was the same for both studies. Primary databases were PubMed, PsycNet, and Medline. 19 SR/MAs met inclusion in Study 1. 38 original epidemiological studies meeting inclusion criteria (PICOTS) with 30573 participants (M=804.5:SD=897.9; range 25-4023) were included in Study 2. Ten subgroup analyses were done: Asian/Non-Asian countries, early/late adolescence, sex, type of traumatic events, clinical/subclinical PTSD, diagnostic tool used, comorbidity, sample settings, single/multiple types of traumas, one/multiple times experience, and type of sampling. AMSTAR checklist was used for risk bias in the meta-epidemiological analysis. The methodological quality was assessed separately by both authors using an adapted risk bias tool (Joanna Briggs Institute: Prevalence Critical Appraisal Tool) in the meta-analysis.

Results: Pooled prevalence of clinical PTSD was 24.4%. PTSD prevalence differed significantly between subgroups namely, sexual/mixed and non-sexual trauma settings, one type vs multiple type and one time vs one-multiple times trauma exposure. The studies reflected considerable heterogeneity at 95% CI. The risk-bias in 38 studies was low (Cohen's kappa= 0.43, $p < .01$) suggesting moderate interrater agreement). Begg's funnel plot indicated publication bias. 34.2% of studies ($n=13$) were silent, 34.2% ($n=13$) mentioned female sex as a risk/moderating factor. 57.8% studies ($n=22$) reported at least one comorbid mental health condition and highest PTSD prevalence was with common mental disorders and suicide.

Conclusions: Absence of national level epidemiological studies, in Asian countries, is a concern. School mental health focusing on regular screening of PTSD among adolescents could be helpful.

Keywords: post traumatic stress disorder, epidemiology, adolescents, PTSD.

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INTRODUCTION

Impact of traumatic incidents like disasters, maltreatment, abuse, cyber bullying, peer group violence could be more devastating during adolescence due to increased physical, social, emotional vulnerability. This may result in development of various psychiatric illnesses including post-traumatic stress disorder (PTSD) and other psychiatric symptoms in adolescents, major depressive disorder, psychosis, anxiety disorders, increased risk of suicide among adolescents, involvement in high-risk behaviours such as substance use, and high-risk sexual behaviour [1]. Nevertheless, PTSD remains as a focused diagnosis in DSM-5, where a known aetiology of the illness is present. There is a plethora of literature reiterating on the presence of mental illnesses in adolescents who have experienced acute trauma, chronic trauma including violent

crimes, earthquakes, road accidents/suicide/homicide. PTSD can occur with comorbid depression and anxiety, specifically, when exposed trauma is sexual/physical assault or witnessed violence. Suicide, poor social support and substance abuse are found among adolescents exposed to repeated traumatic episodes. Symptoms of PTSD in adolescents resemble that of adults, along with the capacity to exhibit prominent aggressive behaviours and impulsivity [2].

The epidemiology of mental illnesses among trauma exposed adolescents varies greatly in terms of type and chronicity of incidents, gender, age, support systems, resilience, etc. PTSD prevalence was 7.8% in physical/psychological violence [3]; 15.2% in boys & 25.2% in girls subjected to physically abusive punishment or assault [4]; 27.8% in female and 14.9% in male victims of sexual abuse [5]; 53.5% in war-conflicted zones [6]; 78% in witnessing death during maritime disaster [7]. Males were exposed to community violence whereas females to family violence [8]. Low socioeconomic status and urbanicity were positively associated with the PTSD diagnosis in adolescents [9].

Research on PTSD prevalence in Asian studies is largely limited to natural disasters and adults, unlike Western studies. Though Asian studies reported symptoms in adolescents can persist long after the traumatic event and are likely to become chronic [10-11]. The increasing number of studies provided unprecedented estimates of PTSD and other mental illnesses among adolescents in various regions of the world [12]. Systematic and narrative reviews have summarized the reported detailed methodological appraisals of studies and there was consensus on non-uniformity of methodological approaches, sampling strategies, and case definitions between original surveys, limiting the comparability of rates in different parts of the world [13-14]. Till date, no meta-analysis looked at PTSD prevalence among adolescents in Asia. The age range in previous MA are very wide such as 2-18 years in some studies [15]. Logically wider age range will raise issues regarding differences in the tool used to diagnose PTSD in children and adolescents and comparing children and adolescents. Earlier, MAs were very specific and limited to natural disasters or conflicts/terrorism. No study analysed research gaps in Asia and comprehensive diverse sub-group analysis. A precise estimate of the adolescents exhibiting PTSD in Asian context would guide in better appraisal of the need for mental health resources, and allocation of such resources, and delivery mechanism of appropriate interventions at least at school level.

We conducted two separate but interlinked studies and findings from both studies are contained in this study. To identify and address the gaps in Study 2, we reviewed systematic reviews (SRs) and meta-analyses (MA) reporting on adolescents' PTSD prevalence in Study 1. Study 2 was a meta-analysis which compared the PTSD prevalence among adolescents in original studies.

METHODOLOGY

Literature Search

Following the PRISMA guidelines, electronic search was performed on three databases, namely, PubMed, PsycNET, Medline. ResearchGate, Wiley and Google Scholar were used for accessing the publications which were not openly available on the main databases or received through visually scanning of reference lists or citation search. For study-1, terms such as ("PTSD in adolescents" or "PTSD epidemiology in adolescents") or ("Post-Traumatic Stress Disorder in adolescents" or "Post-Traumatic Stress Disorder epidemiology in adolescents") or ("PTSD prevalence in adolescents") or ("PTSD in adolescence" or "pooled prevalence of PTSD among adolescents") or ("PTSD prevalence in adolescents") or ("Post-Traumatic Stress Disorder in adolescence" or "pooled prevalence of Post-Traumatic Stress Disorder among adolescents") SR MA papers were separately entered to find out gaps so as to reduce redundancy and to note the sub-group analysis to focus on. While searching for study 2, we also used ("prevalence study" or "epidemiological study" or "meta-epidemiological study" or "systematic review" or "meta-analysis") to filter out SR/MA. For study-2, the key search terms used for were: ("PTSD in adolescents" or "PTSD epidemiology in adolescents") or ("Post-Traumatic Stress Disorder in adolescents" or "Post-Traumatic Stress Disorder epidemiology in adolescents") or ("PTSD prevalence in adolescents") or ("PTSD in adolescence" or "pooled prevalence of PTSD among adolescents") or ("PTSD incidence in adolescents") or ("Post-Traumatic Stress Disorder in adolescence" or "pooled prevalence of Post-Traumatic Stress Disorder among adolescents") AND (Adolescent PTSD with "disasters" or "adverse experiences" or "violence" or "traumatic life events" "accidents" or "terrorist attacks" or "witnessing killings/deaths") or (Adolescent PTSD with "physical abuse" or "sexual abuse" or "serious illnesses" or "bullying") AND ("complex PTSD in adolescents"). Screening of papers was done by title reading, abstract reading and the papers that matched with the inclusion criteria.

Selection Criteria (Inclusion/Exclusion criteria)

Study-1: We included SRs/MAs which included only adolescents as samples and studies which included children-adolescents but with more than 60% adolescents.

Study-2: Original full papers published in peer-reviewed English language journals were included. Titles and abstracts of all potentially relevant articles were reviewed. To reduce selection bias, articles were included following a strict PICOTS format (Population: male & female adolescents between 12-19 years with any type of traumatic experience; Intervention/Indicator: only original prevalence studies where PTSD was a primary diagnosis with/without comorbid mental illness; Comparator: studies that recruited participants through both random and non-random sampling; Outcomes: Primarily outcome PTSD prevalence -with/without comorbid depression and anxiety; Timeframe: Jan 1991-Nov 2023; Settings: epidemiological studies from community/school/hospital/foster care settings). Unpublished thesis/articles, published abstracts without full paper, field reports, prevalence in PTSD intervention studies, and studies with co-morbid severe mental illnesses were excluded.

Data Extraction and Organisation

The data was organised in a Microsoft excel sheet containing information on the study identity (Author, year, country), study setting (school, community, hospital, clinic, institutions), study design, sample characteristics (mean age, sex, sample size), nature of trauma, single-event exposure versus repeated exposure to the trauma, measurement tool used for PTSD diagnosis (clinical interview, self-reported tool), PTSD symptoms (clinical or subclinical) and study outcomes (variables measured, PTSD prevalence). Studies mentioning complex PTSD are also noted down. The data extracted from all studies was checked and relevant information was added to the data on mutual agreement of authors. Diverse sub-group analyses namely, Asia vs non-Asian countries, early adolescence vs late adolescence, males vs females, sexual abuse vs non-sexual abuse trauma experience, PTSD clinical vs subclinical diagnosis, self-reported vs clinical interview based diagnosis, PTSD with and without comorbidity, hospital vs school/community settings, one vs multiple types of trauma history, one vs multiple times of trauma experience, DSM vs ICD diagnosis, and probability vs non-probability sampling.

Risk Bias and Quality of Study Analysis

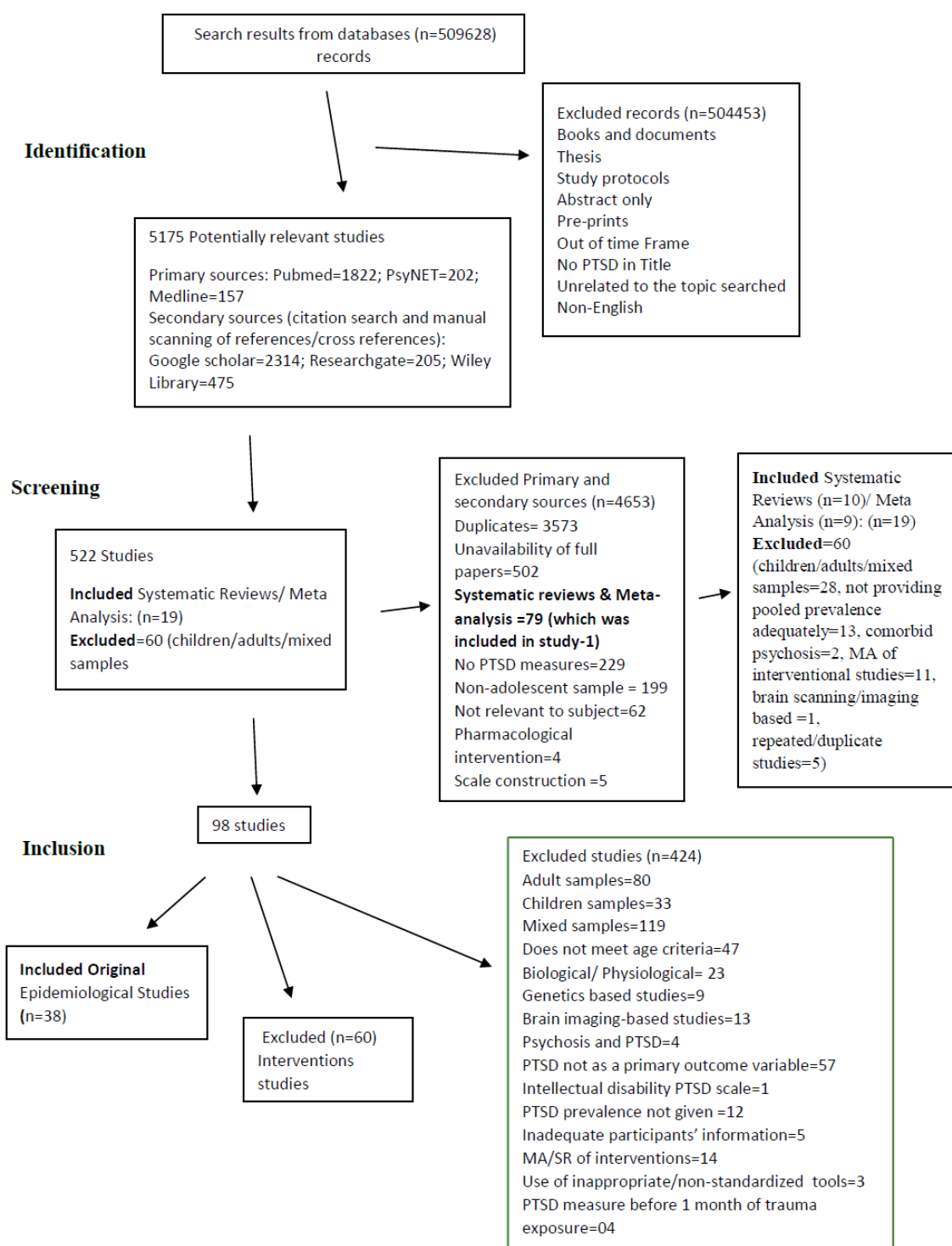
Risk bias of this SR and MA was done following AMSTAR criteria [16]. Quality of the studies included for this meta-analysis was assessed using a risk of bias tool of the Joanna Briggs Institute (Prevalence Critical Appraisal Tool) and following the line of modification used by Woolgar [17-18]. While Woolgar et al. used 6 criteria, we used all 9 criteria originally contained in Joanna Briggs Institute including sample size, setting, recruitment procedures; inclusion criteria; nonresponse rates and reasons; method/tool for diagnosis of the condition; and data analysis. Each study was rated by both the authors separately and agreed upon the rating allocations (13-18 = low risk of bias, 7-12 = medium risk, 0-6 = high risk). The interrater agreement was found out through Cohen's kappa.

Data Analysis

R-software was used for analysing prevalence of PTSD among adolescents [19]. For presence and estimation of heterogeneity, Cochrane's Q test and I^2 index are applied with random-effects analysis [20]. I^2 is not sensitive to changes in the number of studies in the analyses and interpretation of heterogeneity was followed as per existing standard ($I^2 \geq 25\%$ low; $I^2 \geq 50$ moderate; $I^2 \geq 75\%$ substantial; $I^2 \geq 90$ considerable) [21]. Begg's funnel plot was used in evaluating publication bias. For an appropriate statistical power, subgroup analyses were conducted for subgroups reported in more than four studies per outcome [18]. The prevalence of PTSD in adolescence was compared across 10 sub-groups (Table-3).

RESULTS

Study 1: A total of 79 SRs and/or MAs were reviewed by two authors. 19 studies (SR=9 and SRs with MA=10) were analysed. 4 MAs and 3 SRs had sampled only adolescents, remaining had children and adolescents. The time of search included in these 19 studies ranged from 1966 - June 2020 (in MAs) and 1990-Sep 2021 (SRs). Information on the time of search was inadequate in 6 (31.58%) SRs/MAs. The number of moderators ranged from 1-4 including female gender, repeated trauma, less social support, serious physical health problems, poorer family functioning, lower level of optimism and psychosocial difficulties in these studies. Ten subgroup analyses were highest [22] and an average of three were present in the rest of MAs. Quality assessment for the included studies was done in 6 MAs. Majority of studies mentioned selection bias and publication bias.

Figure- 1: PRISMA Sample Recruitment Flow Chart

Study 2: A total of 5,09,628 records were obtained from 3 primary and 3 secondary databases. Out of 522 potentially relevant studies, 60 were interventional studies and 79 were SRs/MAs (Study 1). Remaining original studies (N=38) were included in MA. The summarised process for extracting relevant studies is displayed in the PRISMA flow chart [Figure 1].

Characteristics of the Included Studies (Study 2)

Details of the participants, trauma, and study characteristics are presented in Table 1.

Description of studies: Out of 38 epidemiological studies, 12 were conducted in the USA, 4 in India, 2 each in UK and Canada, 1 each from Sri Lanka, China, Iraq, France, Denmark, Rwanda, South Africa, Kenya, Brazil, Bosnia-Herzegovina, Peru, Morocco, Lithuania, Hungary, Nepal, Pakistan, Malaysia and Austria. In a listed study [26], samples were collected from Lithuania and Japan; however, this was considered under non-Asian category (Table 1).

Sample Characteristics

There were 30573 participants in 38 articles with a good sample size (average $N=804.5$; range 25 - 4023). The age range was between 12-19 years with Mean age=15.08 years ($SD=1.13$). Out of 38, 03 studies included both clinical and subclinical whereas 35 included only clinical PTSD prevalence.

Trauma in Adolescents

It was found that 23 (60.5%) of 38 included studies were based on both acute and chronic traumatic events such as prolonged exposure to assault, abuse, stressful life conditions, sudden accidents, low socio-economic conditions, sexual trauma, death of a loved one and were mostly conducted in non-Asian countries (USA, Canada, Peru, Brazil, Malaysia and European nations). Contrarily, 15 studies (39.4%) on acute trauma were conducted focussed mainly on disaster (natural + man-made including Covid-19) affected adolescents. 29 epidemiological studies (76.3% studies) were based on early adolescence (mean age of participants), whereas 9 on late adolescence. Out of 10 Asian studies reported here, the majority included non-personal trauma such as natural disasters. The prevalence in 60% ($n=23$) studies was based on school going population, whereas community and clinical (hospital /institutional) population was present in 23.7% ($n=9$) and 15.7% ($n=6$) studies respectively. The diagnosis of PTSD was based on self-reporting in 66% ($n=25$) and clinical interview in 34.2% studies ($n=13$).

PTSD with Comorbid Mental Illness

PTSD was with a comorbid condition in 57.9% studies ($n=22$). It was comorbid with depression in 22.7% studies ($n=5$), with both depression and anxiety in 40.9% studies ($n=9$). Furthermore, with CMD (Common Mental Disorders: - depression, anxiety) and substance abuse in 13.6% studies ($n=3$), CMD with suicide in 9.09% studies ($n=2$). 4.5% studies ($n=01$) each reported comorbidity in depression & substance use, only substance use and only suicide. PTSD prevalence without comorbidity was present in 42.1% studies ($n=16$).

Risk/Moderating Factors

While 31.5% of studies ($n=12$) were silent on risk/moderator factors, 34.2 % ($n=13$) mentioned female gender as a risk factor, and remaining 31.6% ($n=12$) studies reported diverse risk/moderating factors including poor social competence, family dysfunction, behaviour, loneliness, low social support, financial difficulties, early and late adolescence, male gender, low socioeconomic conditions, loss of services (water, electricity, clean clothing, food, shelter, transportation), physical injury (to parents/caregiver), deceased parent, parental divorce, familial drug use, low resilience.

PTSD Pooled Prevalence

The pooled prevalence as per the forest plot was 24.4 % (95% CI 19.6% -29.3%).

Weightage of Included Studies and Heterogeneity

Heterogeneity was present as variability in terms of participants, prevalence so weightage of studies, forest plot and Q statistic were included. Meta-analysis proportion was used in statistics for calculating weighted summary of all the included studies with 95% CI. Cochrane's Q statistic for multiple percentage (prevalence percentage) values was found to be 4059.29 and significant ($p < 0.01$), thus, indicating considerable heterogeneity. The I2 index was 99.1% [99.0%; 99.2%]. Funnel plot is presented in figure-2, which indicates publication bias.

Publication Bias: Funnel plot (Fig 3) showed asymmetry which can be an indication of publication bias. These results, however, should be interpreted with caution, as although the number of studies included in this MA is fair enough (in terms of keeping the focus on only adolescents as samples) the wide variation in trauma type, duration, and intensity in all these studies were quite apparent. Since the heterogeneity was significant, we did a sub-group analysis of 10 moderators.

Sub-group Analysis on Prevalence of PTSD (Table 3)

Risk Bias and Quality of Studies: All MAs (Study 1) were analysed through AMSTAR checklist for assessing risk bias. Results indicated that 86% of the criteria in the AMSTAR checklist. To evaluate the risk bias of

this MA (Study 2), two authors (Rater-1 and Rater-2) separately evaluated all 38 studies using modified Joanna Briggs appraisal criteria. Findings indicated that study 2 met 10 out of 11 criteria, while criteria No. 7 was not applicable for prevalence studies. Also, this MA revealed low risk bias (Mean=16.33; Rater-1=16.83, Rater-2=15.84). Cohen kappa showed moderate interrater agreement between the 2 ratings ($\kappa = 0.43$, $p < 0.01$).

Figure 2: Forest plot of epidemiological studies

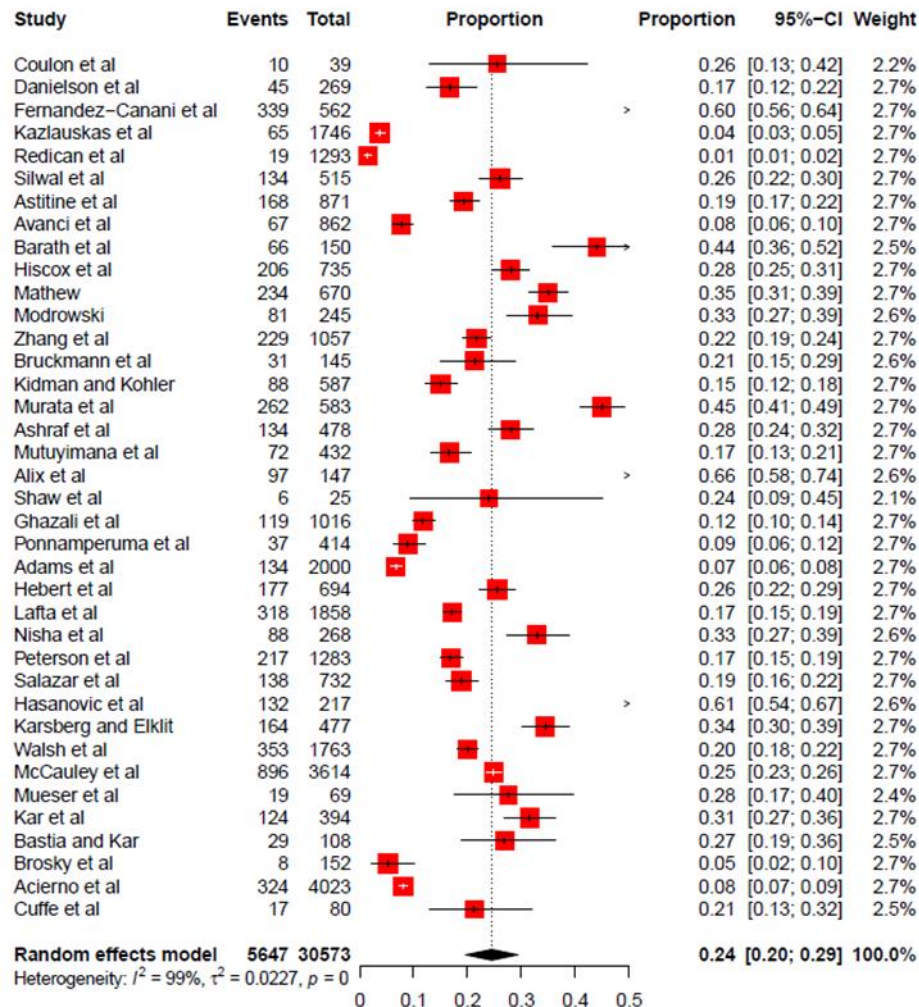
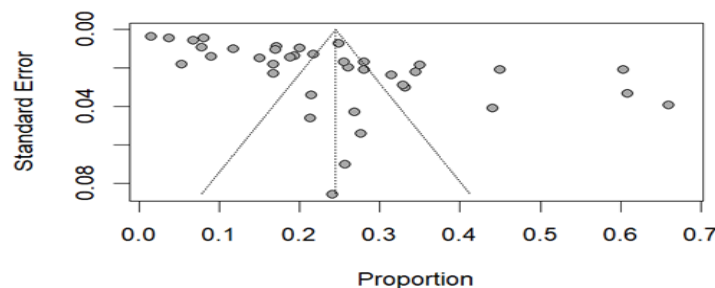


Figure 3: Funnel Point



DISCUSSION

Study 1

We studied all meta-analyses to identify gaps and to add value to the literature by addressing these gaps to update adolescent PTSD literature. As, no SR/MA looked at Asian and Non-Asian comparisons. Majority of MA had few subgroup analyses such as 5 in one study [15]. Pooled prevalence was highest (34%) in cancer survivors [63] and lowest (18.2%) in adolescents in juvenile detention centres [22].

Study 2

A multi-national survey (24 countries between 2001-2012: combined sample of 68,894 adults) reported that over 70% of participants experienced a traumatic event and nearly one-third were exposed to four or more traumatic events [60]. However, no such study was found for adolescents despite the fact that due to multiple factors adolescents are at risk of encountering more traumatic events e.g. physical/sexual abuse, and developing mental disorders with disrupted psychosocial development [61-62]. Further the age criteria to define adolescence vary widely across countries, perhaps therefore adolescents are a largely understudied population and mixed either with children or adults, particularly in Asia.

The included studies reported a range of heterogeneity in terms of diagnostic criteria, research design, sampling and sample size, inclusion criteria which made it difficult to draw general conclusions about the pooled prevalence of PTSD for Asian adolescents. Although there are 48 countries, full papers available from 7 Asian countries that reported adolescents' PTSD prevalence are from China (k=1), India (k=4), Pakistan (k=1), Sri Lanka (k=1), Nepal (k=1), Malaysia (k=1) and Iraq (k=1). No other existing MA has looked at PTSD prevalence among adolescents so comprehensively across 10 sub-group analyses as we did. Notably, diverse PTSD prevalence reported in 38 epidemiological studies were point, lifetime, intermittent (such as at variable time periods 6 months, 10 months, 18 months after trauma exposure) and based on different trauma exposures. The foci were point prevalence to evaluate the pooled PTSD prevalence from 38 studies.

Table-3: Sub-group Comparative Analysis of PTSD Prevalence

Sub-group Comparative Analysis	Group 1	Group 2	Group 3	Statistics
Mean Prevalence (%) SD N	<i>Asian PTSD prevalence</i> 23.95 8.88 10	<i>Non-Asian PTSD Prevalence</i> 24.93 17.08 28	-	t(36)=0.17, p=0.86
Mean Prevalence (%) (%) SD N	<i>Asian comorbid-PTSD</i> 25.65 2.76 4	<i>Non-Asian comorbid-PTSD</i> 27.81 18.81 18	-	t (20) = -0.22, p=0.41
Mean Prevalence (%) SD N	<i>Prevalence early adolescence</i> 23.36 15.19 29	<i>Prevalence late adolescence</i> 28.89 15.50 9	-	t (36)= 0.94, p=0.34
Mean SD N	<i>Males</i> 411.57 545.29 32	<i>Females</i> 447.57 494.25 35	-	t(65)= 0.28, p= 0.77
Mean (%) SD N	<i>Sexual trauma</i> 30.42 20.19 5	<i>Mix trauma prevalence</i> 15.91 10.46 13	<i>Non-sexual-trauma prevalence</i> 28.9 14.73 20	F(2, 35)=3.77, p=0.03

Mean (%) SD N	<i>Self-reported</i> 26.64 14.85 25	<i>Clinical Interview</i> 20.20 16.03 13	-	t(36)= 1.23, p=0.22
Mean (%) SD N	<i>School</i> 26.24 14.46 23	<i>Community</i> 18.4 13.16 9	<i>Hospital and institutions</i> 28.08 20.6 6	F(2,35)=1.03, p=0.36
Mean (%) SD N	<i>PTSD with comorbidity</i> 27.42 16.9 22	<i>PTSD without comorbidity</i> 20.90 11.98 16	-	t (36)= 1.31, p=0.12
Mean (%) SD N	<i>One type</i> 29.34 16.08 23	<i>Multiple type</i> 17.32 10.80 15	-	t(36)=2.49, p=0.01
Mean (%) SD N	<i>One time</i> 31.3 15.98 15	<i>One and multiple times</i> 20.35 13.37 23	-	t(36)=2.28, p=0.02
Mean (%) SD N	<i>Probability sampling</i> 23.94 14.82 33	<i>Non-probability sampling</i> 21.52 9.76 6	-	t(36)=-0.38, p=0.70

This finding of 24.4% PTSD pooled prevalence among adolescents in our study was lower than 34% in Kosir et al [63]; and higher than Beaudry et al. [22]; Dai et al.[64]; Xiong et al. [65]; Alisic et al. [15]. Our finding was not comparable to MA which had reported a range of PTSD prevalence in adolescent sample (9-33.7% Jonas et al. [66]) and mixed sample of children-adolescents (e.g., 3-57% in Nooner et al.[67]).

Globally, 17.8% of the adolescents who were exposed to chronic traumas such as abuse, violence, terrorism had manifested subclinical PTSD (according to current MA). Key reasons could be: (a) difference in perceived intensity of traumatic exposure such as (b) acute or chronic nature of trauma (c) individual, familial or communal origin of trauma; (d) distal or proximal trauma (e) mixed sampling. High PTSD prevalence (clinical and sub-clinical) between 31-60% was predominantly seen in sexual abuse, war/conflicted zones, adolescent patients of chemotherapy, terrorism and residential maltreatment of juveniles. For natural disasters (earthquakes and tornadoes) the prevalence range was 6.7-45%; domestic violence 19-27%; difficult life circumstances 15-21% and community violence around 7%. Additionally, sub-clinical PTSD was in the range 69-70 % in sexual abuse cases and war conflict zones [68].

In the current study, PTSD prevalence in late adolescence (28.89%) was comparatively higher as compared to early adolescence. However, since mean age was used for categorisation of early and late adolescence, that could have affected the prevalence. There was presence of specific comorbidities such as substance use, suicidality in late adolescence, whereas CMD, difficulties in memory and concentration, social impairment, delinquency in early adolescence. Evidence on epidemiological differences of mental disorders in early and late adolescence groups is inadequate. Trauma-related distress and problem behaviours were found for nonviolent life stressors (such as low socioeconomic conditions, negative appraisal) more frequently in urban adolescents, which was lacking in most Asian studies [69]. It was found that 25444 participants belonged to the early adolescence group in 83.2% epidemiological studies included in the current study depicting the active participation from 12-16 years age group. More often, late adolescent subjects were combined with the adult population and early adolescents with children in original and review-meta-analytical studies. This could pose a difficulty in ascertaining the actual prevalence among adolescents.

Although there was no sex difference found in this meta-analysis like Rasmussen et al. earlier studies reported female gender was a significant moderator in adolescent PTSD diagnosis [70-71]. The findings of significant difference in prevalence between one-time vs multiple time trauma experience in our MA was like 20% of revictimized adolescents in Walsh et al.[52]. Recurrent chronic traumas can range from difficult

life circumstances, loss of basic services, low socio-economic conditions, family dysfunction to sexual/physical abuse. Acute trauma (one time trauma exposure) was evidently more prevalent in adolescents with higher PTSD prevalence of 31.3% than chronic (repeated) trauma like previously reported prevalence study [15].

It is to be noted that sexual trauma reported the highest PTSD prevalence of 30.42% in adolescents than pure nonsexual trauma or mixed. Despite high PTSD in this, all the sexual trauma studies were conducted in non-Asian countries, contrary to the non-sexual trauma focus on Asia.

The analysis of 38 studies revealed 57.8% studies included comorbid mental health conditions, 42.1% investigated only PTSD. Delinquency, guilt, shame and fear as well as anxious attachment patterns moderated PTSD prevalence [53,29,48]. The current study also points towards the high adolescent PTSD prevalence of 28.08% in hospitals, clinics and rehabilitation/institutions, followed by 26.9% in schools and 18.4% in the community. The PTSD in school subjects in a Wenchuan study after an acute disaster was 28.4% like the current prevalence of 26.24% [72]. Here, 65.7% studies used self-reporting tools in schools whereas 34.21% studies used interviewing to assess PTSD in hospital/institutional and community settings. Higher prevalence of 26.6% was found in self-reporting methods and they were majorly based on DSM. In the current study 91.4% reporting of PTSD was based on DSM and 8.6% on ICD.

The PTSD prevalence in studies (n=6) that reported the socioeconomic variable was found to be 25.16%. Studies from India and South Africa included socioeconomic status of adolescents, determined based on living standards, per capita income of the family, type of employment and housing. In Asian countries, the sample recruitment was done from private, public and government schools, on the contrary from public schools in non-Asian countries.

Asian Epidemiological Studies

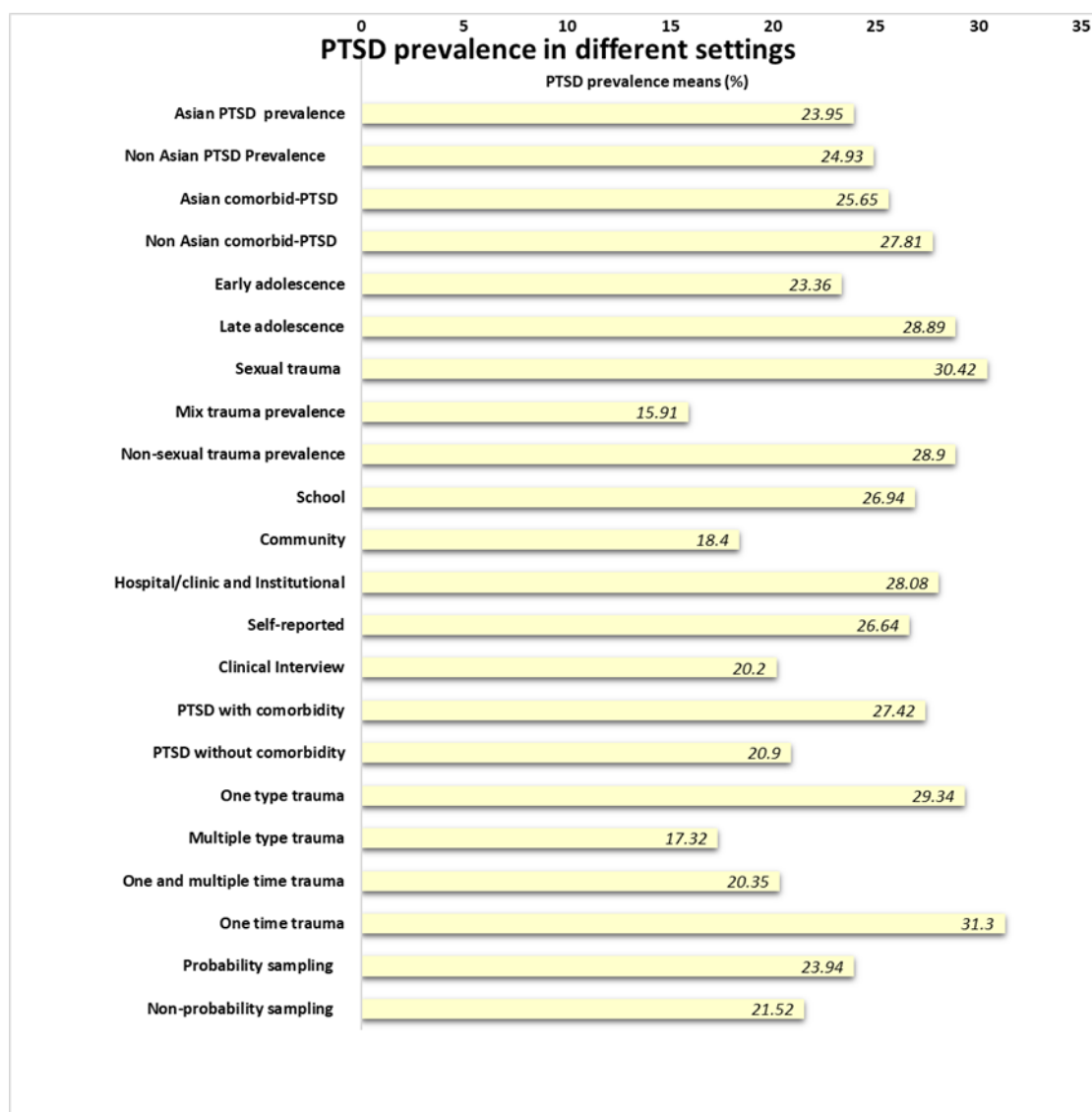
There was a total of ten Asian full papers available. All the studies estimated PTSD prevalence; one study (Sri Lanka) included PTSD sub-clinical prevalence also. In East Asia (China) the PTSD prevalence was based on Covid 19 whereas Western Asia studies were focussed on the terrorism, war and violence. South Asian (India, Nepal and Sri Lanka) and Southeast Asian (Malaysia) studies were on acute trauma (natural disasters), such as earthquake, floods, lifetime trauma (Malaysia) and on child abuse (Pakistan).

It was found that PTSD was diagnosed by self-reporting in 65.7% studies (India, Nepal, China, Pakistan, Malaysia) whereas clinical interviewing in 34.2% (India, Sri Lanka, Iraq). It was observed that most studies in Western Asia such as Iraq, Palestine, Baghdad, had majority of male participants or only male participants for study participation. However, in our study the male vs female adolescents' participation was not statistically different. It was observed that large numbers of adolescents were present in studies conducted in the USA and Europe contrary to Asia. The sample size for the Asian studies was in the range of 305-960 subjects (except a study from Iraq with 1858 adolescents) as compared to large sample sizes of 2000 and 4023 in Europe and USA respectively. The literature on core adolescent PTSD epidemiology is meagre in Asia, and most of them have mixed samples. And this might be due to the definition of adolescents used by the authors ranging from 10-20 years whereas we included samples from 12-19 years as followed by many Asian countries. These mixed sampling studies on PTSD epidemiology may intensify complexity in analysis. Statistically, there was no significant difference between Asian and non-Asian adolescents' clinical PTSD prevalence. 15.9% and 25.6% subclinical PTSD prevalence (mean) in Asian and non-Asian studies. We could not compare it statistically due to its small sample size.

This meta-analysis had few limitations, such as skewed sub-group comparison (no. of studies and sample size), use of different diagnostic tools, difference of data setting, and dissimilar traumatic incidents; hence, the findings should be interpreted with caution. Another limitation was heterogeneity of studies as these epidemiological studies had varied trauma exposure, different settings of recruiting subjects, thus publication bias was seen. Future researchers may investigate the publication bias more rigorously.

CONCLUSION

This systematic review and meta-analysis provide cumulative evidence for a high prevalence of clinical and subclinical PTSD among adolescents. Inadequate epidemiological studies in Asia are a serious concern. Comparing PTSD prevalence between similar types and frequency of traumatic experiences across Asian countries will be important for determination of appropriate steps to minimize the causes of trauma, impact of such incidents and strengthen post-traumatic growth in adolescents.

Figure 4: Graphical comparison of PTSD prevalence in sub-groups

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