



Mental health in adult refugees from Syria resettled in Norway between 2015 and 2017: a nationwide, questionnaire-based, cross-sectional prevalence study

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ABSTRACT

Background: The number of forcibly displaced people globally has never been higher, with refugees from Syria constituting the largest displaced population worldwide. Many studies have documented elevated levels of mental health problems in refugee populations, though prevalence estimates of common mental disorders vary considerably between studies, explained both by methodological and contextual factors.

Objective: Using questionnaire-based screening checklists to approximate the prevalence of and investigate risk factors for post-traumatic stress disorder (PTSD), anxiety and depression among adult refugees from Syria resettled in Norway and to compare estimates with a sister-study in Sweden.

Method: Cross-sectional survey of a randomly selected sample from the National Population Register in Norway of adult refugees from Syria who were granted residency rights in Norway between 2015 and 2017 ($N_{\text{sample}} = 9,990$; $n_{\text{respondents}} = 902$). Above-threshold scores on the Harvard Trauma Questionnaire (HTQ) and Hopkins Symptoms Checklist (HSCL-25) defined caseness for PTSD ($\text{HTQ} > 2.06$); anxiety ($\text{HSCL}_{\text{anxiety}} > 1.75$); and depression ($\text{HSCL}_{\text{depression}} > 1.80$).

Results: Weighted, checklist-positive prevalence estimates for PTSD, anxiety and depression were 29.7% (25.4%-34.4%), 30.1% (25.7%-34.9%), and 45.2% (40.6%-49.8%), respectively. Cumulative exposure to potentially traumatic experiences before or during flight was a clear risk factor for all outcomes, and female gender was a risk factor for anxiety and depression, though only in adjusted analyses. The choice of HTQ cut-off to define PTSD caseness (2.5 vs. 2.06) had a notable effect on prevalence estimates.

Conclusion: In line with prior evidence, the present study suggests adult refugees from Syria resettled in Norway have higher rates of anxiety and depression and markedly higher rates of PTSD compared to general, non-refugee populations, and that this is clearly linked to past traumatic experiences. Prevalence estimates were highly consistent with estimates from the sister-study in Sweden, which used almost identical methodology. Findings underline the importance of screening for and intervening on mental health problems in newly arrived refugees.

ARTICLE HISTORY

Received 5 May 2021
Revised 7 September 2021
Accepted 7 October 2021

KEYWORDS

Refugees; Syria; Norway; mental health; prevalence; PTSD; anxiety; depression; traumatic experiences

PALABRAS CLAVE

Refugiados; Siria; Noruega; salud mental; prevalencia; TEPT; ansiedad; depresión; experiencias traumáticas

关键词

难民; 叙利亚; 挪威; 心理健康; 患病率; PTSD; 焦虑; 抑郁; 创伤经历

HIGHLIGHTS

- Nationwide, questionnaire survey of anxiety, depression and PTSD in adult refugees from Syria resettled in Norway estimated checklist-positive prevalence rates of: 29.7% (PTSD); 30.1% (anxiety); and 45.2% (depression).

Salud mental en adultos refugiados de Siria reinstalados en Noruega entre 2015 y 2017: un estudio de prevalencia transaccional a nivel nacional basado en cuestionarios

Antecedentes: El número de personas desplazadas forzosamente a nivel global nunca ha sido más alto, con los refugiados de Siria constituyendo la mayor población desplazada del mundo. Muchos estudios han documentado elevados niveles de problemas de salud mental en poblaciones refugiadas, aunque las estimaciones de prevalencia de trastornos de salud mental comunes varían considerablemente entre estudios, explicadas tanto por factores metodológicos y contextuales.

Objetivo: Utilizar listas de tamizaje en formato de cuestionarios para estimar la prevalencia e investigar factores de riesgo para el trastorno de estrés postraumático (TEPT), la ansiedad y la depresión entre adultos refugiados de Siria reinstalados en Noruega, y para comparar estimaciones con un estudio hermano en Suecia.

Método: Encuesta transaccional en una muestra seleccionada aleatoriamente del Registro de Población Nacional en Noruega de adultos refugiados de Siria que obtuvieron derechos de residencia entre 2015 y 2017 ($N_{\text{muestral}} = 9990$, n de encuestados = 902). Puntajes por sobre el puntaje de corte del Cuestionario de Trauma de Harvard (HTQ en su sigla en inglés) y la Lista de chequeo de síntomas de Hopkins (HSCL-25 en su sigla en inglés) definió como caso clínico para el TEPT ($\text{HTQ} > 2.06$); ansiedad ($\text{HSCL}_{\text{ansiedad}} > 1.75$); y depresión ($\text{HSCL}_{\text{depresión}} > 1.80$).

Resultados: Las estimaciones ponderadas de prevalencia de positivos en lista de chequeo para TEPT, ansiedad y depresión fueron 29.7% (25.4%–34.4%), 30.1% (25.7%–34.9%), and 45.2% (40.6%–49.8%), respectivamente. La exposición acumulativa a experiencias potencialmente traumáticas antes o durante el vuelo fue un claro factor de riesgo para todos los resultados, y el género femenino fue un factor de riesgo para ansiedad y depresión, aunque solo en análisis ajustados. La elección del puntaje de corte del HTQ para definir caso clínico de TEPT (2.5 versus 2.06) tuvo un efecto notable en las estimaciones de prevalencia.

Conclusión: En línea con evidencia previa, el presente estudio sugirió que los adultos de Siria refugiados y reinstalados en Noruega tienen tasas más altas de ansiedad y depresión, y tasas marcadamente más altas de TEPT comparadas con poblaciones generales no refugiadas, y esto está ligado directamente a experiencias traumáticas anteriores. Las estimaciones de prevalencia fueron altamente consistentes con las estimaciones del estudio hermano en Suecia, el cual utilizó metodología casi idéntica. Los hallazgos subrayan la importancia de tamizar e intervenir en problemas de salud mental en refugiados recién llegados.

2015 年至 2017 年在挪威重新定居的叙利亚成年难民的心理康:一项全国性, 基于问卷的横断面患病率研究

背景:全球被迫流离失所的人数从未如此之多, 来自叙利亚的难民构成了全球最大的流离失所人口。许多研究记录了难民人群中精神健康问题的水平升高, 尽管不同研究之间对常见精神障碍的患病率估计差异很大, 这可以通过方法学和背景因素来解释。

目的:使用基于问卷的筛查检查表来估计在挪威重新安置的叙利亚成年难民中创伤后应激障碍 (PTSD), 焦虑和抑郁的患病率和风险因素, 并与在瑞典进行的姊妹研究进行比较。

方法:对一个从挪威国家人口登记册中随机抽取的2015 年至 2017 年期间获得挪威居住权的叙利亚成年难民样本 ($N_{\text{sample}} = 9,990$; $n_{\text{respondents}} = 902$) 进行横断面调查。哈佛创伤问卷 (HTQ) 和霍普金斯症状检查表 (HSCL-25) 的阈值以上定义了 PTSD (HTQ>2.06), 焦虑 (HSCLanxiety>1.75) 和抑郁 (HSCLdepression>1.80) 的病例。

结果: PTSD, 焦虑和抑郁的加权检查表阳性患病率估计分别为 29.7% (25.4%–34.4%), 30.1% (25.7%–34.9%) 和 45.2% (40.6%–49.8%)。在逃离前或期间累积潜在创伤经历暴露是所有结果的一个明确风险因素, 女性是焦虑和抑郁的风险因素, 尽管仅在调节分析中有这一结果。选择 HTQ 临界值来定义 PTSD 病例 (2.5 对 2.06) 对患病率估计有显著影响。

结论:与先前证据一致, 本研究表明, 与一般非难民人群相比, 在挪威重新定居的叙利亚成年难民有更高的焦虑和抑郁患病率和显著更高的 PTSD 患病率, 这显然与过去的创伤经历有关。患病率估计与使用几乎完全相同方法的瑞典姊妹研究的估计高度一致。结果强调了筛查和干预新抵达难民心理健康问题的重要性。

1. Introduction

At the start of 2020, there were close to 80 million forcibly displaced people globally, which is the highest number on record (UNHCR, 2019). Syrians constitute, by far, the largest forcibly displaced population worldwide with more than six million internally displaced people (IDP) and approximately 6.6 million refugees following the outbreak of the 2011 civil war. An estimated 25,000 refugees from Syria have arrived in Norway since 2011, of which roughly half were asylum seekers, a quarter resettlement refugees and a little under a quarter family reunification refugees (Dzamarija, 2018).

While a substantial number of studies have explored mental health in refugee and conflict affected populations, there has historically been broad variation in the findings of these studies (Turrini et al., 2017). The variation is thought to be caused both by contextual factors and methodological ones, where a debated issue has been whether standardized symptom checklists are valid in measuring mental health across very heterogeneous settings and populations (Rasmussen, Verkuilen, Ho, & Fan, 2015; Rodin & Van Ommeren, 2009; Wind, van der Aa, de la Rie, & Knipscheer, 2017). Recent major reviews have gone

some way towards disentangling and quantifying the effects of key contextual and methodological factors (e.g. 7,8). Still, adjusted prevalence estimates for post-traumatic stress disorder (PTSD) and depression do not converge across reviews, ranging from about 10% in the lower end to over 30% in the upper end for both disorders (Blackmore et al., 2020; Bogic, Njoku, & Priebe, 2015; Charlson et al., 2016, 2019; Steel et al., 2009). Crucially, estimates unequivocally point towards a disease burden of mental disorders in refugee populations that is markedly higher than that found in general, non-refugee populations, especially for PTSD (Kessler et al., 2009; Koenen et al., 2017). Reviews have called for further methodologically rigorous and context-specific studies.

A 2020 review of studies specifically on refugees from Syria has estimated notably higher prevalences of mental disorders: 43.0% for PTSD; 40.9% for depression, and 26.6% for anxiety (Peconga & Høgh Thøgersen, 2020). Similar to previous reviews, high between-study variance was found, despite the population in question being constant in the sense that all were refugees from Syria. This highlights again that methodological factors may play an important role in explaining diverging results. As a point of illustration,

of the six studies in the Peconga et al. review that estimated PTSD prevalence through the Harvard Trauma Questionnaire (HTQ), PTSD caseness was defined in three different ways. Two studies used PTSD symptom cluster criteria (Chung, AlQarni, Al Muhairi, & Mitchell, 2017; Chung et al., 2018); three studies used a HTQ cut-off score of 2.5 (Chung et al., 2018; Ibrahim & Hassan, 2017; Kéri, 2015); and one study used a cut-off score of 2.06 (Tinghög et al., 2017). In addition, there are also many potential non-methodological explanations for the high variability between studies relating to refugees' pre-, peri-, and post-migration experiences and obvious differences between host-countries and their policies towards refugees (Gleeson et al., 2020; Li, Liddell, & Nickerson, 2016). Further methodologically sound studies within different host-country settings may help clarify this complex picture.

Given the inherent characteristics of the refugee experience and the known negative and cumulative effects of traumatic experiences on the risk of PTSD in non-refugee populations, a central topic of investigation in refugee studies has been how potentially traumatic experiences (PTEs) impact upon mental health. This effort has to some extent been hampered by the absence of established standards in the field on how PTEs should be measured in refugee populations (Scoglio & Salhi, 2020; Sigvardsdotter, Malm, Tinghög, Vaez, & Saboonchi, 2016). Nonetheless, most reviews have found clear associations between PTEs and mental disorders (e.g. 7,11), even if some have not (Charlson et al., 2016, 2019). Importantly, though, the latter two reviews investigated conflict-affected populations rather than refugees per se, and focused on traumatic events directly related to war experiences. Prior studies on Syrian refugees have documented strong positive associations between traumatic experiences and mental disorders (e.g. Acarturk et al., 2018; Alpak et al., 2015; Tinghög et al., 2017). In terms of sociodemographic factors, there is inconsistent evidence on whether gender is associated with mental health problems in refugees and conflict-affected populations, with some reviews concluding there is an association (Blackmore et al., 2020; Charlson et al., 2016, 2019; Porter & Haslam, 2005; Roberts & Browne, 2011), whereas others not (Bogic et al., 2015; Peconga & Høgh Thøgersen, 2020; Steel et al., 2009). More recent research has begun to address nuances in gender as a risk factor, suggesting that exploring only cross-sectional associations between gender and mental health may misrepresent this complex relationship (Wu et al., 2021). Furthermore, duration of stay in host country has been found to be adversely linked to mental health (Gleeson et al., 2020), though the explanation behind this link remains to be fully understood.

The present study is modelled upon a prior study in Sweden (Tinghög et al., 2017), and the two studies

share many methodological features – e.g. eligibility criteria, the use of random sampling from total population registries and identical instruments and translations to measure mental health. These similarities provide a strong opportunity for cross-country comparison.

The overarching aim of the current study is to contribute to the field of refugee mental health with important context- and population-specific findings on the burden of and risk factors for mental health problems in a refugee population recently resettled in a Western European country. Using survey data from a randomly selected nationwide sample of adult refugees from Syria granted residency rights in Norway between 2015 and 2017, the primary objectives are to:

- (1) Approximate the prevalence of PTSD, anxiety and depression based on standardized symptom checklists (i.e. the HTQ for PTSD and the Hopkins Symptom Checklist, HSCL-25, for anxiety and depression) and compare findings with the sister-study in Sweden (Tinghög et al., 2017).
- (2) Explore risk factors for the above mental disorders with a particular focus on refugees' experience of potentially traumatic events prior to arrival in Norway.

The first objective is described in detail in the study's pre-registration in the ClinicalTrials.gov database, whereas parts of the analytic strategies to address the second objective are less clearly outlined in the pre-registration (e.g. how certain variables were categorized and multivariate models built). A secondary post hoc objective is to compare and contrast findings on PTSD in relation to whether caseness was defined by the study's pre-registered HTQ cut-off value of 2.06 versus by the more commonly used cut-off of 2.5.

2. Methods

2.1. Design and participants

Methodological details and descriptive statistics can be found in the study's pre-registration in ClinicalTrials.gov (NCT03742128) and published cohort profile (Nissen, Cauley, Saboonchi, Andersen, & Solberg, 2020).

The present study used a cross-sectional survey design. Eligible participants included all registered refugees from Syria >18 years of age who were granted temporary or permanent residency in Norway between January 2015 and December 2017. Refugees were either UNHCR quota refugees (resettlement refugees), refugees entering Norway through family reunification programmes, or asylum seekers whose asylum application had been approved. A complete list of eligible

participants was obtained from the Norwegian National Registry ($N = 14,350$) and a simple, random, sample of 9,990 individuals was drawn in August 2018. The study launched in November 2018, when all sampled individuals were sent a study invitation letter, the survey and a prepaid return envelope. The letter explained key elements of the study and outlined consent procedures and withdrawal options. A consent form had to be signed and returned with the questionnaire for a person to be included as by the approved study protocol. After several extensions, the study closed in September 2019. One reminder request for non-responders was delivered via postal mail or telephone in the spring of 2019. The Regional Committees for Medical and Health Research Ethics (REC) – Region Southeast (A) in Norway was responsible for ethical oversight of the project (reference number 2017/1252). The research and consulting firm, Ipsos, was contracted to handle all logistical aspects of data collection.

2.2. Variables and measurements

The three outcome variables in the present study were checklist-positive posttraumatic stress disorder (PTSD), anxiety and depression, defined by mean scores above predetermined thresholds on relevant symptom scales. We apply the terms checklist-positive (cp) to emphasize that caseness is based on symptom checklists and not a clinical interview which is the diagnostic gold-standard. Thus, for example, the term *cp-PTSD* designates a person who scores above the cut-off for PTSD. The term *cp-mental disorders*, abbreviated *cp-MD*, is used as an umbrella term for all three outcomes.

2.2.1. Posttraumatic stress disorder

Symptoms of PTSD were measured using the first 16 items of section IV of the Harvard Trauma Questionnaire (HTQ), each scored on a 4-point Likert scale ranging from 1 = Not at all to 4 = Very much (Mollica et al., 1992). The 16 items are based on the criteria for PTSD in the American Psychiatric Association's Diagnostic and Statistical Manual of mental disorders, version IV (DSM-IV). The HTQ scale is the most widely used scale for studies on PTSD in refugee populations (e.g. 23), though evidence from studies on construct validity across different populations and cultures is somewhat conflicting (Darzi, 2017; Rasmussen et al., 2015; Wind et al., 2017). The most frequently used cut-off to estimate probable PTSD is a mean score ≥ 2.5 , established in a population of Indochinese refugees (Mollica et al., 1992). A later study on primary care patients in Bosnia and Herzegovina, however, found that a mean score > 2.06 was optimal for identifying probable PTSD (Oruc et al., 2008), and this cut-off was applied by the sister-study in Sweden (Tinghög et al.,

2017). To facilitate comparison with both the Swedish sister-study and other relevant studies, the present study reports PTSD findings using both the study's pre-registered cut-off value of 2.06 and the more commonly used 2.5 cut-off value. Caseness based on the two cut-offs is denoted $cp\text{-}PTSD^{>2.06}$ and $cp\text{-}PTSD^{\geq 2.5}$, respectively. A mean score was not calculated for participants with three or more missing values on the HTQ scale. Cronbach's alpha for the 16 items was 0.92.

2.2.2. Anxiety and depression

Symptoms of anxiety and depression were measured using the Hopkins Symptom Checklist (HSCL-25), with the first 10 items measuring anxiety and the latter 15 depression (Mollica, Wyshak, De Marneffe, Khuon, & Lavelle, 1987). All items are scored on a 4-point Likert-scale ranging from 1 = Not at all to 4 = Extremely. Studies on construct validity and reliability from different settings and populations, including among refugees, broadly support the psychometric properties of the checklist (Hollifield et al., 2002; Tinghög et al., 2017; Wind et al., 2017). The recommended cut-off mean score is 1.75 for both anxiety and depression. In the present study, a mean score > 1.75 was used to define cp-Anxiety, however, the study used a cut-off of > 1.80 to define cp-Depression based on the abovementioned study in Bosnia (Oruc et al., 2008) which found that this cut-off maximized sensitivity and specificity for detecting major depressive disorder. This was also the chosen cut-off in the sister-study in Sweden. A mean score was not calculated for participants with three or more missing on a given subscale. Cronbach's alphas for the anxiety and depression subscales were 0.93 and 0.94, respectively.

2.2.3. Potentially traumatic experiences (PTEs)

Potentially traumatic experiences (PTEs) were measured with the Refugee Trauma History Checklist (RTHC), which has been validated in refugee populations (Sigvardsson et al., 2016, 2017). The RTHC asks about eight PTEs both pre-flight and during flight. All 16 items are answered with Yes/No. To facilitate comparisons with existing evidence, an overall measure of exposure to PTEs was constructed using the concept of adversity ratio introduced by Steel et al. in 2009 (Steel et al., 2009). Specifically, a PTE-adversity ratio (PTE-AR) was obtained by dividing the total number of PTEs experienced before and during flight by the total number asked about (16 in the present study). The PTE-AR was then divided into the following four groups: < 0.2 ; $0.2\text{--}0.29$; $0.3\text{--}0.39$; and ≥ 0.4 in line with the review by Steel et al. This categorization of the PTE variable was not pre-registered.

The Arabic translation of all scales was done by our collaborating partners in Sweden using standard

double-blind translation and back-translation unless complete translations already existed. The questionnaire was piloted through interviews with Arabic-speaking patients in a rehabilitation centre for war and torture trauma in Sweden (for details, please see 20).

2.2.4. Flight-related measurements and background

Length of flight was estimated using self-reported date of leaving home country and self-reported date of arriving in Norway, and categorized into: <3 months; 3 months-2 years; 2-4 years; and >4 years. *Time in Norway* was estimated using self-reported date of arriving in Norway and the date the questionnaire was returned, categorized into: <2 years; 2-3 years; 3-4 years; and >4 years. These variables were not pre-registered, thus the categories were chosen based on the variables' distributions, with the aim of having comparable numbers in categories and each end of the spectrum represented in a theoretically meaningful way. For example, for *Length of flight*, we wanted to capture those with a very short flight (<3 months) as well as those with a protracted flight (>4 years). *Refugee status* upon arrival had the answer choices: asylum seeker; quota refugee; family reunion; and other, though the latter category was dropped as there were <5 refugees in this category. The variable *Arrived with . . .* asked whether a participant arrived alone, with friends but no family/spouse, or with family and/or spouse. The variable *Prior family Norway* asked whether any family members had previously resettled in Norway (Yes/No).

Self-report sociodemographic data included education and marital status. Education was split into: ≤9 years; 10-12 years; and >12 years; and marital status into married; unmarried; and divorced/separated/widow(er) to be consistent with the study's pre-registration and facilitate comparison with the sister-study in Sweden. Age and gender were based on registry data, with age split into the same age groups as the sister study in Sweden (18-29 years; 30-39 years; 40-49 years; 50-64 years; and ≥65 years).

2.3. Statistical analysis

Frequency distributions and simple cross-tabulations were used to create descriptive tables and check variables for errors, outliers and missing. Approximated prevalence with 95% confidence intervals (95% CI) were obtained using the *proportion* command in Stata. Given marked distributional differences for age and civil status between participants and the source populations (Nissen et al., 2020), weighted approximated prevalences for participants were calculated using post-stratification weights with age and civil

status defining the strata used for weight estimation (Royal, 2019).

Logistic regression was used to estimate adjusted odds ratios (ORs) for all mental health outcomes for each pre- and peri-flight PTE. Multicollinearity was checked before adding all PTEs to the same logistic model. Logistic regression was also used to build the final multivariable models exploring the full set of predictors. Crude estimates are included to highlight potential confounding patterns when covariates were added to models. Only participants with data for all variables included in a given regression model were included in that model (listwise deletion). The number of participants contributing data to models are indicated in the respective models in the tables. Because of the high number of participants with missing on the variables *Length of flight* and *Time in Norway*, these two variables were added in the final step (models 3), so that models exploring the other predictors could be estimated with the maximum available data (models 2). As a sensitivity analysis, fully adjusted regression models were rerun with imputed data obtained from multiple imputation by chained equations, MICE (White, Royston, & Wood, 2011). The imputation model included all variables in the final analysis models (except *Arrived with . . .* which was discarded due to perfect prediction). As a second sensitivity analysis included in supplementary material, the final regression models of PTSD, anxiety and depression were repeated using linear regression with the mean-item score of the respective scales as the outcome. This was done in order to focus on symptom severity rather than a disease/no-disease dichotomy. Likelihood ratio test (LRT) was used to evaluate whether multicategorical variables could be modelled linearly without a significant worsening of model fit. Internal consistency of the main questionnaires (HTQ and HSCL) was tested using Cronbach's alpha. All analyses were performed with Stata version 16 (STATA Corporation, College Station, TX, USA). Please see Supplementary file S2 for analytic codes.

3. Results

Table 1 in Methods gives descriptive statistics on the study population. Overall mean symptom scores with standard deviations (SD) on mental health outcomes were: 1.86 (SD = 0.61, $n = 877$) for PTSD; 1.61 (SD = 0.62, $n = 886$) for anxiety; and 1.77 (SD = 0.67, $n = 877$) for depression.

Table 2 shows the prevalence estimates with 95% CIs for all checklist-positive mental disorders (cp-MDs), with the prevalence for PTSD presented for both the 2.06 and the 2.5 cut-off values on the HTQ. The overall cp-PTSD prevalence in weighted analysis was 29.7% (95% CI 25.4%-34.4%) using the 2.06 threshold and 13.1% (95% CI 10.0%-16.9%) using

Table 1. Descriptive statistics on participating adult refugees from Syria resettled in Norway between 2015 and 2017.

	<i>n</i>	(%)
Gender (<i>n</i> =902)		
Male	582	(64.5)
Female	320	(35.5)
Age (<i>n</i> =902)		
18–29 yrs	197	(21.8)
30–39 yrs	310	(34.4)
40–49 yrs	230	(25.5)
50–64 yrs	145	(16.1)
≥65 yrs	20	(2.2)
Education (<i>n</i> =882)		
≤ 9 yrs	394	(44.7)
10–12 yrs	158	(17.9)
>12 yrs	330	(37.4)
Marital status (<i>n</i> =902)		
Married/partner	595	(66.0)
Divorced/widow(er) ^a	71	(7.9)
Unmarried	236	(26.1)
Refugee status (<i>n</i> =860)		
Asylum seeker	454	(52.8)
Quota refugee	273	(31.7)
Family reunion	133	(15.5)
Arrived with ... (<i>n</i> =879)		
... family/spouse	576	(65.5)
... friends only	56	(6.4)
... alone	247	(28.1)
Prior fam Norway (<i>n</i> =870)		
Yes	276	(31.7)
No	594	(68.3)
Length of flight ^a (<i>n</i> =644)		
<3 months	248	(38.5)
3 months – 2 yrs	158	(24.5)
2–4 yrs	162	(25.2)
>4 yrs	76	(11.8)
Time Norway ^b (<i>n</i> =755)		
<2 yrs	126	(16.7)
2–3 yrs	164	(21.7)
3–4 yrs	385	(51.0)
>4 yrs	80	(10.6)
PTE-AR (<i>n</i> =819)		
<0.20	163	(19.9)
0.20–0.29	79	(9.7)
0.30–0.39	158	(19.3)
≥0.40	419	(51.2)

^aThe full category included: widow(er), surviving partner, separated/separated partner, divorced/divorced partner.

the 2.5 threshold. Weighted cp-Anxiety prevalence was estimated at 30.1% (95% CI 25.7%–34.9%) and weighted cp-Depression at 45.2% (95% CI 40.6%–49.8%). There were clear dose-response relationships between increasing trauma exposure as measured through the PTE-AR and the prevalence of all cp-MDs. Comparing the most exposed refugees (PTE-AR ≥0.40) to those least exposed (PTE-AR <0.20), the former group had two- to threefold higher estimated prevalence for cp-Anxiety and cp-Depression and about five times higher estimated prevalence for cp-PTSD, regardless of cut-off used.

Table 3 shows the frequencies of experienced PTEs, the estimated prevalence of cp-MDs by each PTE, and adjusted measures of associations (ORs) between individual PTEs and cp-MDs. Overall, a high proportion of participants reported PTEs and all PTEs were more frequently reported before flight than during flight. In terms of cumulative PTE exposure, the majority of participants (51.2%) ranked in the highest category for PTE-AR – i.e. answering affirmatively on more

than 40% of all PTEs inquired about. Looking at the estimated prevalence of cp-MDs in relation to individual PTEs, there was a fairly clear pattern of markedly higher prevalences in participants who had experienced physical violence or assault; torture; or sexual violence. This was true for all mental disorders and for PTEs experienced both prior to and during flight. In particular, for participants exposed to sexual violence, the estimated prevalence of cp-PTSD^{>2.06}, cp-Anxiety and cp-Depression was around or over 70%. There was strong to very strong evidence that almost all PTEs were individually associated with markedly higher odds of cp-MDs after adjusting for demographic and flight-related variables (OR¹). After adjusting for the other seven PTEs in each respective RTHC scale (OR²), the strength of evidence for individual PTEs weakened and the ORs were lower. Nonetheless, there was still evidence of associations between several individual PTEs and cp-MDs.

Tables 4–5 show the crude and adjusted multivariable models for cp-MDs. In terms of PTSD, there was very strong evidence in adjusted models that cumulative PTE was associated with markedly higher odds of cp-PTSD, regardless of cut-off. Specifically, compared to participants in the lowest cumulative PTE group (PTE-AR <0.20), those in the highest group (PTE-AR ≥ 0.40) had over 8 times the odds of cp-PTSD^{>2.06} in adjusted analysis (OR = 8.38, 95% CI 4.56–15.4, $p < .001$). There was also strong evidence of an association between cumulative PTE and cp-PTSD if the 2.5 cut-off was used, though the ORs were somewhat lower. Furthermore, there was strong to very strong evidence that cumulative PTE was associated with markedly higher odds of both cp-Anxiety and cp-Depression, with the most exposed group (PTE-AR ≥0.40) having over four times the odds of cp-Anxiety compared to the least exposed group (OR = 4.43, 95% CI 2.60–7.54, $p < .001$) and almost five times the odds of cp-Depression (OR = 4.91, 95% CI 2.98–8.09, $p < .001$). There was very strong evidence in adjusted models that females had higher odds of both cp-Anxiety and cp-Depression compared to males (though not in crude models), and moderate evidence that older age, being unmarried and longer length of stay in Norway were associated with increased odds for both disorders.

4. Discussion

The present study, based on a randomly selected nationwide sample of adult refugees from Syria who were resettled in Norway between 2015 and 2017, found high levels of exposure to potentially traumatic experiences (PTEs) both before and during the flight to Norway, and a high burden of mental health problems. Weighted approximated prevalence of mental disorders based on symptom checklist scores were around 30% for PTSD and anxiety and over 40% for

Table 2. Prevalence of checklist-positive (cp) mental disorders with 95% confidence intervals (95% CI) in participating adult refugees from Syria.

	cp-PTSD ^{2,3}			cp-Anxiety			cp-Depression		
	Prev.	(95% CI)	X ²	Prev.	(95% CI)	X ²	Prev.	(95% CI)	X ²
Overall	34.7	(31.5–37.9)		14.9	(12.6–17.5)		31.7	(28.7–34.9)	
Gender									
Unweighted	29.7	(25.4–34.4)		13.1	(10.0–16.9)		30.1	(25.7–34.9)	
Weighted	36.0	(32.0–40.1)	0.27	16.3	(13.4–19.6)	0.13	29.7	(26.0–33.6)	0.08
Male	32.3	(27.1–37.8)		12.5	(9.0–16.6)		35.5	(30.2–41.0)	
Female	31.8	(25.3–38.9)	0.02	11.5	(7.3–16.8)	0.07	31.1	(24.6–38.1)	0.02
Age									
18–29 yrs	31.9	(26.7–37.5)		15.3	(11.4–19.9)		30.3	(25.2–35.8)	
30–39 yrs	33.3	(27.2–40.0)		13.1	(8.9–18.2)		27.1	(21.4–33.4)	
40–49 yrs	45.5	(37.1–54.0)		19.6	(13.4–27.0)		41.8	(33.6–50.4)	
50–64 yrs	42.1	(20.3–66.5)		31.6	(12.6–56.6)		40.0	(19.1–63.9)	
>65 yrs	32.6	(28.0–37.6)	0.31	13.2	(10.0–17.0)	0.31	29.7	(25.2–34.5)	0.64
Education									
≤9 yrs	32.0	(24.6–40.1)		13.3	(8.3–19.8)		32.5	(25.2–40.5)	
10–12 yrs	37.6	(32.3–43.1)		17.1	(13.1–21.6)		32.8	(27.7–38.2)	
>12 yrs	31.4	(27.7–35.4)	0.01	13.1	(10.4–16.1)	0.04	28.9	(25.3–32.8)	0.02
Marital status									
Married/partner	47.1	(34.8–59.6)		23.5	(14.1–35.4)		43.5	(31.6–56.0)	
Divorced/widow(er)	39.2	(32.8–45.9)		17.2	(12.5–22.7)		35.4	(29.2–41.9)	
Unmarried	36.7	(32.2–41.4)	0.35	17.1	(13.7–20.9)	0.24	32.4	(28.1–37.0)	0.54
Refugee status									
Asylum seeker	31.3	(25.8–37.3)		14.0	(10.0–18.7)		29.0	(23.6–34.8)	
Quota refugee	34.9	(26.7–43.8)		11.6	(6.7–18.5)		33.6	(25.6–42.4)	
Family reunion	31.4	(27.6–35.4)	0.01	11.9	(9.4–14.9)	0.001	29.3	(25.6–33.3)	0.08
... family/spouse	35.8	(23.1–50.2)		13.2	(5.5–25.3)		31.5	(19.5–45.6)	
... friends only	42.1	(35.9–48.6)		21.9	(16.9–27.6)		37.3	(31.2–43.8)	
... alone	33.9	(28.3–39.9)	0.81	13.7	(9.8–18.3)	0.55	35.2	(29.5–41.2)	0.16
Yes	34.8	(30.9–38.8)		15.2	(12.4–18.4)		30.4	(26.7–34.3)	
No	40.6	(32.8–48.8)	0.16	12.4	(8.6–17.3)	0.53	30.6	(24.9–36.8)	0.24
Prior fam Norway									
3 months	29.8	(22.9–37.5)		15.5	(10.2–22.2)		38.5	(30.8–46.6)	
3 months – 2 yrs	30.3	(20.2–41.9)		13.2	(6.5–22.9)		30.4	(23.4–38.2)	
2–4 yrs	20.8	(14.1–29.0)	0.001	3.2	(0.9–8.0)	0.001	27.0	(17.4–38.6)	0.02
>4 yrs	37.3	(29.8–45.2)		14.9	(9.8–21.4)		22.0	(15.0–30.3)	
Time Norway									
2–3 yrs	35.4	(30.6–40.5)		15.3	(11.9–19.4)		37.2	(29.8–45.1)	
3–4 yrs	41.1	(29.7–53.2)		20.5	(12.0–31.6)		31.1	(26.5–36.1)	
>4 yrs	10.0	(5.8–15.7)	<0.001	3.8	(1.4–8.0)	<0.001	40.3	(29.2–52.1)	<0.001
PTE-AR									
< 0.20	23.4	(14.5–34.4)		10.4	(4.6–19.4)		15.4	(10.2–21.9)	
0.20–0.29	30.3	(23.2–38.2)		12.3	(7.5–18.5)		21.5	(13.1–32.2)	
0.30–0.39	48.2	(43.3–53.1)		21.9	(18.0–26.2)		27.8	(21.0–35.5)	
≥0.40							41.7	(36.9–46.7)	

Total number of participants with data on outcome variables: *n* = 877 (cp-PTSD^{2,3}); *n* = 886 (cp-Anxiety); *n* = 877 (cp-Depression).

Table 3. Prevalence estimates (95% CIs) and odds ratios, ORs, of checklist-positive (cp) mental disorders by potentially traumatic experiences (PTEs).

	<i>n</i>	cp-PTSD ^{>2.06}			cp-PTSD ^{≥2.5}			cp-Anxiety			cp-Depression		
		Prev	95% CI	OR ¹ /OR ²	Prev	95% CI	OR ¹ /OR ²	Prev	95% CI	OR ¹ /OR ²	Prev	95% CI	OR ¹ /OR ²
<i>Before flight (perimigratory PTEs)</i>													
War at close quarter	- 41	10.0	(2.8–23.7)	4.7b/1.5	5.0	(0.6–16.9)	3.1/1.3	14.6	(5.6–29.2)	2.4b/1.1	24.4	(12.4–40.3)	
	+ 840	35.7	(32.4–39.1)		15.2	(12.8–17.8)		32.3	(29.1–35.6)		40.9	(37.5–44.3)	2.0/0.8
Forced separation from fam/friends	- 324	22.1	(17.6–27.1)	2.8c/1.6 ^a	9.1	(6.2–12.9)	2.2b/1.2	22.4	(17.9–27.3)	2.4c/1.6 ^a	28.9	(23.9–34.2)	
	+ 480	43.3	(38.8–47.9)		18.7	(15.3–22.5)		38.2	(33.8–42.7)		47.9	(43.3–52.5)	2.5c/1.7 ^b
Loss/disappearance of family/friends	- 287	21.9	(17.2–27.2)	2.6c/1.5	9.2	(6.1–13.2)	2.2b/1.3	23.5	(18.7–28.9)	2.0c/1.2	31.3	(26.0–37.1)	
	+ 526	41.5	(37.2–45.9)		17.9	(14.7–21.5)		36.6	(32.5–40.9)		44.2	(39.8–48.6)	1.9c/1.2
Physical violence or assault	- 554	25.3	(21.7–29.1)	4.3c/2.4 ^b	9.2	(6.9–11.9)	3.7c/1.8	25.0	(21.4–28.8)	3.5c/2.7 ^c	32.3	(28.4–36.4)	
	+ 232	56.6	(49.9–63.2)		28.3	(22.5–34.7)		48.0	(41.4–54.7)		58.7	(52.0–65.3)	3.4b/2.0 ^b
Witnessing physical violence/assault	- 304	18.1	(13.9–23.0)	3.4c/1.7 ^a	6.7	(4.1–10.2)	2.8c/1.6	21.5	(17.0–26.5)	2.4c/1.4	25.8	(20.9–31.1)	
	+ 520	44.9	(40.5–49.3)		20.4	(17.0–24.2)		37.8	(33.6–42.2)		49.1	(44.7–53.6)	3.0c/2.0 ^b
Torture	- 567	27.0	(23.4–30.9)	3.4c/1.4	9.5	(7.2–12.2)	3.8c/1.7	27.3	(23.7–31.2)	2.4c/0.9	34.5	(30.6–38.6)	
	+ 212	55.8	(48.8–62.7)		29.1	(23.0–35.8)		43.5	(36.6–50.5)		57.4	(50.3–64.2)	2.8c/0.9
Sexual violence	- 710	31.4	(28.0–35.0)	4.9c/1.7	12.2	(9.9–14.9)	5.1c/1.9	29.1	(25.7–32.6)	5.6c/2.6 ^a	37.0	(33.4–40.7)	
	+ 51	71.4	(56.7–83.4)		44.9	(30.7–59.8)		68.0	(53.3–80.5)		77.1	(62.7–88.0)	5.8c/2.8 ^a
Other perceived life-threat. situations	- 103	8.9	(4.2–16.2)	6.4c/2.3	5.0	(1.6–11.2)	3.4b/1.4	15.7	(9.2–24.2)	3.1b/1.4	21.8	(14.2–31.1)	
	+ 754	38.6	(35.1–42.3)		16.3	(13.7–19.2)		33.8	(30.4–37.4)		43.1	(39.5–46.7)	3.1c/1.4
<i>During flight (perimigratory PTEs)</i>													
War at close quarter	- 408	33.9	(29.3–38.8)	1.0/0.5 ^a	14.4	(11.1–18.2)	1.0/0.6	29.0	(24.6–33.7)	1.4/0.6 ^a	37.3	(32.5–42.2)	
	+ 420	34.2	(29.6–39.1)		13.6	(10.4–17.4)		33.6	(29.0–38.3)		43.1	(38.2–48.1)	1.4b/0.7
Forced separation from fam/friends	- 412	25.2	(21.0–29.7)	2.4c/1.8 ^b	10.4	(7.6–13.8)	2.1b/1.5	24.6	(20.5–29.1)	2.0c/1.2	31.2	(26.7–36.0)	
	+ 373	44.8	(39.6–50.1)		19.7	(15.7–24.1)		39.4	(34.4–44.6)		50.1	(44.9–55.4)	2.4c/1.7 ^b
Loss/disappearance of family/friends	- 422	25.4	(21.3–29.9)	2.4c/1.7 ^a	10.6	(7.8–13.9)	2.3c/1.5	23.8	(19.8–28.1)	2.5c/1.8 ^a	30.8	(26.4–35.5)	
	+ 362	45.5	(40.2–50.8)		20.5	(16.4–25.1)		40.9	(35.8–46.2)		51.1	(45.8–56.5)	2.5c/1.8 ^b
Physical violence or assault	- 638	29.6	(26.1–33.4)	4.0c/2.0 ^a	11.5	(9.1–14.2)	3.8c/1.8	28.1	(24.6–31.7)	3.3c/1.3	36.8	(33.1–40.8)	
	+ 125	57.7	(48.5–66.6)		30.9	(22.9–39.9)		49.2	(40.0–58.4)		56.7	(47.3–65.7)	2.9c/1.1
Witnessing physical violence/assault	- 566	28.6	(24.9–32.6)	2.5c/1.2	11.7	(9.2–14.7)	2.2b/0.6	26.0	(22.4–29.8)	2.8c/1.3	35.1	(31.2–39.3)	
	+ 214	50.0	(43.0–57.0)		23.3	(17.8–29.6)		46.5	(39.6–53.4)		54.6	(47.5–61.5)	2.4c/1.1
Torture	- 657	29.8	(26.3–33.5)	4.3c/3.7 ^c	11.6	(9.2–14.3)	3.8c/2.5 ^a	27.1	(23.7–30.7)	4.3c/2.4 ^a	35.9	(32.2–39.7)	
	+ 100	63.3	(52.9–72.8)		34.7	(25.4–45.0)		59.6	(49.3–69.3)		67.4	(57.0–76.6)	4.1c/2.8 ^b
Sexual violence	- 722	32.7	(29.3–36.3)	4.1b/1.0	13.0	(10.6–15.7)	8.6c/3.8 ^a	29.6	(26.2–33.1)	9.1c/3.5	38.1	(34.5–41.8)	
	+ 20	65.0	(40.8–84.6)		50.0	(27.2–72.8)		70.0	(45.7–88.1)		77.8	(52.4–93.6)	7.7b/2.8
Other perceived life-threat. situations	- 350	27.2	(22.5–32.2)	1.8b/1.2	9.6	(6.7–13.3)	2.3b/1.8	23.7	(19.3–28.5)	2.2c/1.6	33.5	(28.5–38.8)	
	+ 468	40.2	(35.7–44.8)		19.0	(15.5–22.9)		37.4	(32.9–41.9)		46.0	(41.3–50.6)	1.7b/1.1

OR¹ adjusted for gender, age, education, marital status, refugee status, arrived with fam/friends/alone, and prior family in Norway.OR² adjusted for same as OR¹ plus other PTEs within scale (i.e. OR for a given pre-flight PTE is adjusted for other PTEs in pre-flight scale).

depression, though a low participation rate could affect generalizability. There was very strong evidence that higher levels of exposure to PTEs before or during flight were associated with markedly higher odds of all three mental disorders, with a clear underlying dose-response relationship. The approximated prevalence for PTSD was sensitive to the choice of cut-off in the Harvard Trauma Questionnaire, with the prevalence more than halved if the 2.5 cut-off was used rather than the study's pre-registered value of 2.06. The choice of cut-off point, however, had limited impact on risk factor findings. Approximated prevalences were highly consistent with the sister-study in Sweden (Tinghög et al., 2017).

The present study's approximated PTSD prevalence of about 30% is in line with summary estimates from several major reviews on general refugee populations (Blackmore et al., 2020; Bogic et al., 2015; Steel et al., 2009), though somewhat higher than Charlson et al.'s estimates for conflict-affected populations (Charlson et al., 2016, 2019). Compared to the sister-study in Sweden (Tinghög et al., 2017), which had roughly identical inclusion criteria, followed the same nationwide recruitment strategy with random sampling from total population registries, and used an identical Arabic translation of the HTQ with the same cut-off value for PTSD (>2.06), the approximated PTSD prevalences were very consistent: 34.7% vs. 30.6% in unweighted analysis and 29.7% vs. 29.9% in weighted analysis in Norway and Sweden, respectively. If the 2.5 cut-off was used, the unweighted PTSD prevalence estimates in the two countries were 14.9% in Norway and 15.2% in Sweden (obtained through email correspondence with F. Saboonchi, Prof. [sabf@rkh.se] in April 2021). In a recent review by Peconga et al. on refugees from Syria, PTSD prevalence estimates ranged from 25% to 83% in included studies (Peconga & Høgh Thøgersen, 2020). Three of these studies used the 2.5 cut-off value on the HTQ to define PTSD caseness (Chung et al., 2017; Ibrahim & Hassan, 2017; Kéri, 2015) and their estimated PTSD prevalence ranged from 35% to 65%, which is significantly higher than the 13.1% found in weighted analysis in the present study if applying the 2.5 cut-off. Potential explanations for the notably lower estimate in the present study could be related to sampling and recruitment strategy, sample size, and response rate, all shown to be associated with prevalence estimates (Charlson et al., 2016; Steel et al., 2009). A further important difference is that participants in the present study had all been granted permanent or temporary residency as opposed to the participants in the other three studies, many of whom were awaiting asylum decisions with the associated risks for mental ill health that confers (Solberg, Vaez, Johnson-Singh, & Saboonchi, 2020). A more conservative PTSD prevalence estimate of 7% was reported in another recent

Norwegian study on refugees from Syria which used the 2.5 cut-off (Strømme et al., 2020), though the study population had less exposure to traumatic events compared to the present study and population-based random sampling was not used. Overall, the discussion above highlights the well-known heterogeneity of evidence on PTSD in refugee populations, further highlighting the need for comparisons of estimates between studies of similar design, methodological rigourousness and host-country context. The very consistent estimates found in Norway and Sweden support this argument and the reliability of the methods used and findings in these studies. However, it does not imply that the chosen cut-off value of 2.06 is more valid than the 2.5 cut-off in identifying true PTSD cases among adult refugees from Syria. Considering the sensitivity of prevalence estimates to the choice of cut-off demonstrated in the present study, validation studies exploring optimal HTQ cut-off values in this population are warranted. Furthermore, the field of refugee research should aim towards using the gold standard clinical interview to estimate prevalences with more accuracy in the future.

Despite being the most widely used and validated screening instrument to measure PTSD symptoms in refugee populations, the HTQ scale used in the present study is based on version 4 of the DSM (DSM-IV), which was replaced by version 5 in 2013 (DSM-V). Given that the diagnostic criteria for PTSD changed somewhat in the DSM-V version (e.g. the symptom cluster *Negative alterations in cognition and mood* was added), a limitation of the study's approximated PTSD prevalence is that it may not accurately estimate PTSD prevalence according to the most recent DSM criteria. A new and updated HTQ-5 version using the DSM-V criteria was introduced in 2018, though this version is in the early phases of validity and reliability testing (Megan Berthold et al., 2019). Moreover, the World Health Organization introduced a somewhat different and simplified diagnostic framework for PTSD in the 11th version of the International Classification of Diseases, ICD-11, with a reduction in the number of symptoms required for the PTSD diagnosis compared to the DSM-V (6 vs. 20, respectively), and the introduction of Complex PTSD, CPTSD (Maercker et al., 2013). Validation studies in several non-refugee populations have supported this simplified model (Hansen, Hyland, Armour, Shevlin, & Elklit, 2015), and evidence is also emerging supporting the validity and use of the ICD-11 to estimate PTSD in refugee populations (Barbieri et al., 2019; Vallières et al., 2018; Vang, Nielsen, Auning-Hansen, & Elklit, 2019). Although there are several overlapping diagnostic criteria for PTSD/CPTSD in the DSM and ICD-11 diagnostic frameworks (Hansen et al., 2015), there is some evidence to suggest that they will estimate somewhat

different prevalence in refugee populations (Barbieri et al., 2019). Therefore, the present study's approximated PTSD prevalence must be interpreted in light of the HTQ's reliance on the now outdated DSM-IV criteria in addition to the uncertainty regarding optimal cut-off to define PTSD caseness among adult refugees from Syria. Table S1 in the supplementary material shows the result of fully adjusted *linear* regression analysis of PTSD symptom severity (i.e. HTQ mean-item score) regressed on relevant predictors. As can be seen from the table, the overall findings are fairly consistent with the fully adjusted logistic models in Table 4 in terms of which predictors associate with PTSD, though the statistical evidence in the linear models is generally stronger. Additionally, *Time in Norway* crosses the 0.05 significance level in the linear model.

The study's approximated prevalence of around 40% for depression and 30% for anxiety are somewhat higher than estimates in prior major reviews on general refugee populations (Blackmore et al., 2020; Bogic et al., 2015; Steel et al., 2009) and notably higher than those in recent reviews by Charlson et al. on conflict-affected populations (Charlson et al., 2016, 2019). They are nonetheless well within the range of estimates in these reviews. If the more conventional cut-off of 1.75 was used for depression (instead of 1.80), the estimated prevalence was 43.7%. The overall high degree of exposure to PTEs among study participants in the present study, taken together with the documented positive association between PTE exposure level and depression (Steel et al., 2009), may explain part of why at least depression estimates in the present study are comparatively high. When comparing depression and anxiety estimates to other studies on adult refugees from Syria only, findings are more congruent, with most studies reporting depression prevalences around 30% to 40% and anxiety prevalences around 20% to 35% (Peconga & Høgh Thøgersen, 2020; Strømme et al., 2020). The measures used for depression in these studies were quite diverse: six different measures or versions of scales were used across the eight reported studies; suggesting a certain robustness of findings to the measurement method applied. Again, when the present study is compared to its sister-study in Sweden, depression and anxiety estimates are highly comparable. Weighted depression prevalence in the Swedish study was estimated at 40.2% vs. 45.2% in the present study, and weighted anxiety prevalences were estimated at 31.8% and 30.1% in Sweden and Norway, respectively. As highlighted in the discussion on PTSD above, the consistency in estimates across the two studies, given their many similarities, is reassuring from the point of view of reliability of results. Comparing the logistic models to the linear models of symptom severity of anxiety and depression in the supplementary

material (Table S1), findings are again quite similar in terms of the patterns of associations. However, there was some evidence in the linear models that divorced/widowed refugees had more symptoms of both anxiety and depression compared to married ones and weak evidence that refugees arriving alone had more symptoms of depression compared to refugees who came with family/spouse (none of these was above the 0.05 threshold in logistic regression).

For all outcomes in the present study – checklist-positive PTSD, anxiety and depression – it is of course important to stress that mental ill health does not fit neatly into dichotomized, disease/no-disease categories. Refugees whose symptoms scores fall below population-derived thresholds may nonetheless suffer psychological distress that adversely impacts their lives and functioning and that could warrant clinical attention. Screening instruments are just that, and cannot replace more in-depth face-to-face interviews where nuances, subtleties and individualities may be detected and explored in further details whenever necessary.

The findings of clear dose-response associations between cumulative traumatic exposure (PTE-AR) and all three mental disorders are in line with prior evidence (Bogic et al., 2015; Steel et al., 2009), and congruent with studies in non-refugee populations (Kessler et al., 2009; Koenen et al., 2017). Specifically, the study's approximated prevalence across PTE-AR categories and the meta regression estimates from Steel et al. are surprisingly similar for both PTSD^{>2.06} and depression. The exception is that refugees in the highest PTE-AR category in the present study had higher estimated prevalences for both disorders, which could be related to the overall high cumulative PTE burden in the study population with potentially more participants having PTE-ARs closer to 1.0, pushing estimates upwards. The adjusted ORs in multivariable models tell a similar story of markedly increased odds of all cp-MDs with increasing PTE-ARs. The changes in ORs between crude and adjusted models were generally small (except for cp-PTSD^{≥2.5}), indicating limited confounding by covariates in the models. When the fully adjusted models were repeated with imputed data using MICE, the statistical evidence for a dose-response association was even stronger, and, for PTSD^{>2.06}, the ORs were pushed further from the null value of 1.00 (results not shown in tables).

There was weak evidence in the fully adjusted model that female gender was associated with higher odds of PTSD^{>2.06}. In sensitivity analyses, the results were mixed, with a clear positive association between female gender and higher PTSD symptom levels in linear regression, though no association when the fully adjusted logistic model was rerun on imputed

Table 4. Crude and adjusted logistic regression models with odds ratios, ORs, and 95% CIs for checklist-positive PTSD using both the 2.06 and 2.5 cut-off on the Harvard Trauma Questionnaire to define PTSD caseness.

	cp-PTSD ≥ 2.06						cp-PTSD ≥ 2.5					
	Model 1 (crude)		Model 2 (n=710)		Model 3 (n=508)		Model 1 (crude)		Model 2 (n=710)		Model 3 (n=508)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender												
Age												
Female	0.85	(0.63–1.14)	1.46	(0.96–2.22)	1.73 ^a	(1.04–2.88)	0.73	(0.49–1.09)	1.21	(0.70–2.08)	1.68	(0.84–3.35)
30–39 yrs	1.01	(0.68–1.48)	1.06	(0.63–1.78)	1.58	(0.82–3.02)	1.39	(0.81–2.40)	1.44	(0.72–2.89)	2.43	(0.95–6.22)
40–49 yrs	1.07	(0.71–1.62)	1.24	(0.70–2.22)	1.68	(0.82–3.44)	1.16	(0.64–2.10)	1.40	(0.64–3.09)	1.94	(0.68–5.55)
≥50 yrs	1.76 ^a	(1.14–2.72)	2.79 ^b	(1.47–5.28)	3.50 ^b	(1.57–7.81)	2.05 ^a	(1.15–3.68)	2.38 ^a	(1.04–5.43)	3.65 ^a	(1.19–11.2)
Education												
10–12 yrs	0.97	(0.65–1.45)	1.01	(0.62–1.62)	1.05	(0.59–1.86)	1.01	(0.58–1.76)	0.89	(0.47–1.68)	1.03	(0.46–2.32)
>12 yrs	1.24	(0.91–1.69)	1.07	(0.72–1.61)	1.26	(0.77–2.07)	1.35	(0.89–2.05)	1.16	(0.70–1.93)	1.42	(0.73–2.75)
Marital status												
Div./widow	1.94 ^a	(1.17–3.22)	1.78	(0.91–3.48)	1.59	(0.65–3.88)	2.05 ^a	(1.11–3.77)	1.62	(0.78–3.37)	2.08	(0.79–5.46)
Unmarrie ^d	1.41 ^a	(1.02–1.93)	1.84 ^a	(1.10–3.07)	2.18 ^a	(1.16–4.11)	1.38	(0.91–2.10)	1.30	(0.67–2.51)	1.47	(0.63–3.45)
Quota ref	0.79	(0.57–1.09)	0.84	(0.53–1.35)	1.20	(0.60–2.39)	0.79	(0.51–1.20)	1.08	(0.59–1.97)	2.10	(0.87–5.04)
Ref. status												
Fam reunion	0.92	(0.61–1.39)	1.21	(0.66–2.20)	1.32	(0.63–2.79)	0.64	(0.35–1.15)	0.81	(0.36–1.84)	0.94	(0.33–2.62)
... friends only	1.22	(0.68–2.20)	1.26	(0.59–2.73)	0.85	(0.31–2.30)	1.12	(0.49–2.59)	1.22	(0.44–3.35)	0.92	(0.22–3.81)
Arrived with ...												
... alone	1.59 ^b	(1.17–2.18)	1.47	(0.93–2.33)	1.54	(0.86–2.74)	2.07 ^c	(1.39–3.08)	1.99 ^a	(1.12–3.52)	1.77	(0.80–3.89)
Prior fam Norway	1.04	(0.77–1.41)	1.06	(0.68–1.66)	0.73	(0.43–1.25)	1.14	(0.75–1.72)	0.91	(0.52–1.61)	0.77	(0.38–1.54)
PTE-AR	2.75 ^b	(1.31–5.75)	2.51 ^a	(1.12–5.62)	2.08	(0.83–5.25)	2.98	(0.99–8.90)	1.82	(0.53–6.24)	1.75	(0.44–6.98)
0.30–0.39	3.92 ^c	(2.11–7.28)	3.61 ^c	(1.84–7.11)	2.35 ^a	(1.08–5.10)	3.59 ^b	(1.39–9.24)	2.84 ^a	(1.07–7.51)	1.74	(0.56–5.43)
≥0.40	8.37 ^c	(4.82–14.5)	8.38 ^c	(4.56–15.4)	7.74 ^c	(3.90–15.3)	7.20 ^c	(3.08–16.8)	5.95 ^c	(2.50–14.2)	4.34 ^b	(1.63–11.6)
Length flight	0.96	(0.82–1.12)	1.04	(0.83–1.31)	1.04	(0.83–1.31)	0.96	(0.77–1.20)	0.92	(0.66–1.26)	0.92	(0.66–1.26)
Time Norway	1.29 ^b	(1.08–1.55)	1.30	(0.96–1.75)	1.30	(0.96–1.75)	1.60 ^c	(1.23–2.08)	1.48 ^a	(1.00–2.19)	1.48 ^a	(1.00–2.19)

Significant results ($p > 0.05$) highlighted in bold: ^a $p < 0.05$ ^b $p < 0.01$ ^c $p < 0.001$.

Model 1: unadjusted/univariable logistic regression (i.e. separate logistic models for each predictor, with each model containing only the outcome and one predictor in question).

Model 2: adjusted for all variables in table except *Length of flight* and *Time Norway*.

Model 3: adjusted for all variables in table.

For models 2 and 3, the number of participants contributing data is indicated at the top of the respective columns.

Ref:groups: male (Gender); 18–29 (Age); ≤9 yrs (Edu); married (Mar. status); asylum seeker (Ref. status); family/spouse (Arrived with); Yes (Prior fam Norway); <0.20 (PTE-AR).

Table 5. Crude and adjusted logistic regression models with odds ratios, ORs, and 95% CIs for checklist-positive anxiety and depression.

	cp-Anxiety						cp-Depression					
	Model 1 (crude)		Model 2 (n=718)		Model 3 (n=512)		Model 1 (crude)		Model 2 (n=708)		Model 3 (n=505)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender	1.30	(0.97–1.75)	2.30 ^c	(1.51–3.50)	2.73 ^c	(1.65–4.53)	1.03	(0.78–1.37)	2.14 ^c	(1.41–3.23)	2.38 ^b	(1.44–3.94)
Age	0.96	(0.65–1.42)	1.09	(0.66–1.80)	1.14	(0.62–2.11)	1.06	(0.73–1.54)	1.28	(0.78–2.12)	1.43	(0.77–2.68)
	0.82	(0.54–1.26)	1.03	(0.58–1.84)	0.98	(0.49–1.97)	1.05	(0.70–1.56)	1.83 ^a	(1.05–3.21)	2.11 ^a	(1.06–4.22)
	1.58 ^a	(1.02–2.45)	2.82 ^b	(1.50–5.30)	2.83 ^b	(1.30–6.17)	1.61 ^a	(1.05–2.47)	3.08 ^b	(1.63–5.82)	3.63 ^b	(1.64–8.00)
Education	1.14	(0.76–1.70)	1.24	(0.78–1.98)	1.34	(0.77–2.32)	1.10	(0.75–1.61)	1.13	(0.71–1.79)	1.44	(0.83–2.50)
	1.16	(0.84–1.59)	1.09	(0.73–1.62)	1.18	(0.72–1.93)	1.33	(0.98–1.80)	1.08	(0.73–1.59)	1.24	(0.76–2.01)
Marital status	1.89 ^a	(1.14–3.14)	1.34	(0.69–2.59)	1.29	(0.54–3.09)	2.33 ^b	(1.40–3.87)	2.06 ^a	(1.05–4.02)	1.68	(0.69–4.08)
	1.35	(0.97–1.86)	1.96 ^b	(1.18–3.25)	2.02 ^a	(1.09–3.73)	1.67 ^b	(1.22–2.28)	2.90 ^c	(1.76–4.78)	2.98 ^c	(1.62–5.50)
Ref. status	0.85	(0.61–1.18)	0.91	(0.57–1.45)	1.78	(0.91–3.49)	0.70 ^a	(0.51–0.96)	0.61 ^a	(0.39–0.97)	1.35	(0.69–2.65)
	1.05	(0.70–1.59)	1.03	(0.57–1.88)	1.28	(0.62–2.65)	0.65 ^a	(0.43–0.98)	0.65	(0.36–1.16)	0.95	(0.46–1.98)
Arrived with . . .	1.11	(0.61–2.02)	1.46	(0.69–3.10)	1.52	(0.61–3.77)	1.07	(0.61–1.90)	0.79	(0.37–1.66)	1.09	(0.44–2.71)
	1.43 ^a	(1.04–1.97)	1.39	(0.87–2.20)	1.27	(0.72–2.26)	1.66 ^b	(1.22–2.25)	1.33	(0.85–2.07)	1.46	(0.83–2.56)
Prior fam Norway	0.80	(0.59–1.09)	0.91	(0.59–1.41)	0.74	(0.45–1.24)	1.10	(0.82–1.47)	1.04	(0.67–1.60)	0.77	(0.46–1.29)
PTE-AR	1.50	(0.76–2.98)	1.36	(0.63–2.91)	1.80	(0.78–4.15)	1.17	(0.61–2.25)	1.13	(0.54–2.36)	1.09	(0.45–2.61)
	2.12 ^b	(1.22–3.67)	2.12 ^a	(1.15–3.91)	1.61	(0.79–3.29)	2.41 ^b	(1.46–3.97)	2.51 ^b	(1.42–4.41)	2.25 ^a	(1.14–4.41)
Length flight	3.93 ^c	(2.46–6.28)	4.43 ^c	(2.60–7.54)	4.21 ^c	(2.28–7.78)	4.25 ^c	(2.76–6.53)	4.91 ^c	(2.98–8.09)	4.85 ^c	(2.67–8.83)
Time Norway	0.96	(0.82–1.12)	0.98	(0.78–1.23)	0.98	(0.78–1.23)	0.91	(0.78–1.06)	0.94	(0.75–1.18)	0.94	(0.75–1.18)
	1.20 ^a	(1.00–1.43)	1.52 ^b	(1.14–2.04)	1.52 ^b	(1.14–2.04)	1.42 ^c	(1.20–1.69)	1.42 ^c	(1.20–1.69)	1.52 ^b	(1.13–2.05)

Significant results ($p > 0.05$) highlighted in bold; ^a $p < 0.05$ ^b $p < 0.01$ ^c $p < 0.001$.

Model 1: unadjusted/univariable logistic regression (i.e. separate logistic models for each predictor, with each model containing only the outcome and one predictor in question).

Model 2: adjusted for all variables in table except *Length of flight* and *Time Norway*.

Model 3: adjusted for all variables in table.

For models 2 and 3, the number of participants contributing data is indicated at the top of the respective columns.

Ref. groups: male (Gender); 18–29 (Age); ≤9 yrs (Edu); married (Mar. status); asylum seeker (Arrived with); Yes (Prior fam Norway); <0.20 (PTE-AR).

data. This may reflect the mixed results in prior reviews (e.g. 7,10,11,14) although several studies looking only at refugees from Syria have found that female gender is a risk-factor for PTSD (Acarturk et al., 2018; Alpak et al., 2015; Javanbakht et al., 2019). Interestingly, in unadjusted analysis, it appeared that females had equal, or even lower risk of PTSD compared to men, though this was likely due to strong confounding by other variables, especially PTE exposure (i.e. men reported significantly more exposure to PTEs than women). When testing if the association between gender and PTSD varied across strata of PTE-AR, that is, whether gender and PTE-AR interacted, we did not find any evidence of this. The strong associations between female gender and both cp-Anxiety and cp-Depression in fully adjusted models is somewhat discordant with the bulk of evidence on refugees at large, which tend to report weaker or no associations (Bogic et al., 2015; Peconga & Høgh Thøgersen, 2020; Porter & Haslam, 2005; Steel et al., 2009), though consistent with several studies on Syrian refugees (Acarturk et al., 2018; Javanbakht et al., 2019). Again, there was strong confounding by covariates causing marked differences between crude ORs showing no associations, and adjusted ORs with very strong evidence of associations. Studies to date have not reached consensus on the link between gender and mental ill health in refugee populations, in part due to nuances and complexities that may be missed in cross-sectional studies. A recent, large, 4-wave longitudinal study exploring the relationships between pre- and post-migratory stressors and mental health outcomes in resettled refugees in Australia observed marked differences between genders, and patterns of associations which fluctuated over time (Wu et al., 2021). This research encourages careful consideration of the way gender and mental health interact in this population. Future studies exploring gender in relation to mental health in refugee populations are needed – e.g. are the mental health effects of post-resettlement stressors such as financial and social strain, discrimination and language difficulties gendered or gender-neutral; are the mental health trajectories different for males and females after resettlement in a host country and what are risk and protective factors for healthy trajectories across gender. The finding that time in Norway was positively associated with both cp-Anxiety and cp-Depression is consistent with some prior research in the field (e.g. Heeren et al., 2014), however, there is no consensus in this finding (for an overview, please see 21). There are, of course, a multitude of factors that may interact with length of stay and contribute to mental health outcomes, many of which relate to the conditions in the host country around asylum processes, economic support, integration policy, and social support. Nonetheless, one way to interpret this finding could also be that the adverse consequences on

mental health conferred by the many adversities refugees typically experience prior to resettlement do not necessarily go away by themselves just by removing refugees from the context of trauma/war and placing them in safer environments. This supports the importance of actively screening for and intervening against psychological distress and mental disorders in this vulnerable group by host countries.

The present study has one obvious and potentially serious limitation in that less than 10% of invited participants returned the questionnaire. If participants are not representative of the source population, the study's validity could be compromised. Applying post-stratification weights may partly correct for biased prevalence estimates due to selection bias, however, this procedure assumes that participants in weight-defining strata are representative of all members of that strata in the source populations. Comparing early-responders who returned the questionnaire within the first month of study launch ($n = 433$) to late-responders (returned after the first month; $n = 464$), there was slight evidence that early-responders had higher odds of cp-PTSD^{>2.06} (but not cp-PTSD^{>2.5}), though no evidence of a difference in the odds for cp-Anxiety or cp-Depression was found. The consistency in findings between the present study and the sister-study in Sweden where the participation rate was above 30% also gives some reassurance that selection bias has not grossly skewed findings. Nonetheless, we cannot rule out issues with selection bias due to the low response rate. Another potential limitation concerns how missing data was handled for pre- and peri-migratory PTEs. Sensitivity analysis showed that allowing for more missing when calculating the PTE-AR somewhat increased prevalence estimates in the lowest PTE-AR group, and consequently pushed ORs downwards for the other PTE-AR groups in multivariable models for all mental disorders, though not substantially. On a more general level, there is marked variability in how different studies measure PTEs (e.g. the number and types of PTEs inquired about), which should be kept in mind when interpreting findings related to the PTE-AR. The cross-sectional design of the study places clear constraints on the ability to draw causal conclusions from findings, even if most of the study's predictor variables are objective in nature and many have a temporal order. Lastly, given that a fairly large number of statistical tests were conducted and some of them were not pre-registered in detail (e.g. Table 3), there is a risk that some findings are chance-findings (i.e. type-I error). Given the consistency with theory and prior evidence, and the clear dose-response relationship, we believe it is unlikely that the associations between PTE-ARs and mental ill health are due to chance even if the analytic handling of the PTE-AR variable was not pre-registered.

4. Conclusion

Congruent with a large and growing body of literature on mental health in refugee populations, the present study suggests a clearly elevated burden of PTSD, anxiety and depression in adult refugees from Syria recently resettled in Norway compared to general, non-refugee populations (Kessler et al., 2009; Koenen et al., 2017). The study also found strong evidence in support of the established adverse links between pre- and perflight traumatic experiences and mental health. The consistency of prevalence estimates for the above mental disorders in the present study and sister-study in Sweden, given the high degree of methodological overlap between the studies, lends credibility to the methods used and the robustness and accuracy of findings. The study underlines the importance of screening for and intervening on mental health problems in newly arrived refugees.

Data availability statement

Data are available upon reasonable request. Deidentified participant data will be made available for reuse upon reasonable request pending ethics approval, compliance with the General Data Protection Regulation (GDPR), and discretion of the research group with regard to the prospective research project proposals. Requests should be sent to the corresponding author: a.f.w.nissen@nkvts.no.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The study was funded by the institute where the researchers work (AN, PC, AA, ØS). No external funding was received.

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