

# Somatic distress among Syrian refugees in Germany: analysis of a cross-sectional register-based study

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## Research

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# Abstract

**Background:** Previous studies have already proven high rates of common mental disorders in Syrian refugees. Nevertheless, little is known about the patterns of somatic distress among this refugee population. For this reason, we aim to examine the prevalence, co-occurrence and risk factors of somatic distress among Syrian refugees in Germany.

**Methods:** The study design was a register-based cross-sectional survey of 116 adult Syrian refugees with residence permission in Germany. The survey consisted of information on sociodemographic and migration-specific characteristics, health care utilization, traumatic life events, acculturative stress (Barcelona Immigration Stress Scale – BISS; subscales: perceived discrimination, intercultural contact stress, homesickness, and general psychosocial stress) and self-reported outcomes of somatic distress (Patient Health Questionnaire 15), depression (Patient Health Questionnaire – 9), generalized anxiety disorder (GAD – 7), and post-traumatic symptoms (Essen Trauma Inventory).

**Results:** Almost half of respondents (49.1%) were identified as being at risk of somatic distress (PHQ-15 score  $\geq 6$ ), and even 24.1% being bothered by moderate to severe levels of somatic distress (PHQ-15 score  $\geq 10$ ). The most robust associations with somatic distress were found for female gender, the amount of health care utilization, multiple trauma exposures, general psychosocial stress, self-reported depression and anxiety symptoms. High comorbidities with somatic distress were shown for all common mental disorders studied.

**Conclusions:** To date, there was no data on the specific patterns of somatic distress among Syrian refugees in Germany. The presented study reveals a significant risk of somatic distress among this displaced population and highlights implications for policy and health care providers.

## Background

In 2011, peaceful protests in Syria were violently suppressed, followed by nine years of civil war and one of the largest refugee crises in the world to date. More than half of the Syrian population had to leave their homes and build a new life in another place or country (1). As a result, since 2014, Syrians represent the largest group of refugees in Germany, with the highest number of asylum applications in 2016 (266.250 Syrian asylum seekers) (2). It is now common knowledge that this population who has been forced to flee war and armed conflict zones is likely to have experienced traumatic events, including violence, loss of property, and separation from family (3–5). Ongoing post-migration stressors in the host countries, such as uncertainty about the extension of residence permission, language barriers, perceived discrimination, as well as worries about relatives in the home countries, can put additional strain on refugees' mental health (3, 6, 7). In this respect, high prevalence rates of mental disorders among Syrian refugees have been widely reported for posttraumatic stress disorder (PTSD; 11–84%), depression (15–65%), and anxiety disorders (14–60%) (3–5, 8–13). These three common mental disorders have attracted most attention in existing studies, while only a few researchers have investigated the prevalence and properties of somatic symptoms including somatic distress (SOD) among this displaced population. This is the case, although previous studies among refugee populations have shown rates of SOD going up to even 63% (14–16). An exception regarding the investigation of the Syrian refugee population represents a recent study among 1678 Syrian refugees, registered in Istanbul, Turkey. In this sample, 41.7% were at risk of SOD (17). Since somatic symptoms are often the reason why people with mental health problems present to medical services first, not only organic physical complaints but also emotional complaints that express themselves physically should be considered in order to increase health service efficiency (14, 18).

SOD, which is known as somatic symptom disorder under the DSM-V, is typically characterized by an extreme focus on physical symptoms that causes major emotional distress and problems functioning, and therefore increases the perceived need for health care service utilization (19, 20). It manifests as physical discomfort that may or may not be associated with another medical condition, producing symptoms such as insomnia or pain in the chest, head, or stomach. In addition to the associated burden of those affected, providing necessary treatment for the disorder poses a problem for mental health care institutions, especially in the case of refugees (14, 21, 22). Somatization, the associated unconscious process by which

psychological distress is expressed as physical symptoms, is particularly challenging in multicultural contexts where patients and physicians often disagree about their illness-related beliefs and practices, treatments, and health care expectations (23). Most of the patients expect to be predominantly treated for their bodily symptoms rather than for their mental problems. Social, cultural and linguistic differences between patients and physicians can create additional misunderstandings and barriers to the development of a therapeutic relationship (14).

By now, there is striking evidence about a somatic comorbidity among refugees with PTSD, depression, and anxiety disorders (15, 17, 24, 25). Especially for refugees with depression or PTSD high comorbidity rates with physical complaints have been reported (15, 26, 27). A recently conducted epidemiological study of 502 asylum-seekers in Germany assessed mental disorders including somatization. Among this sample with 10% coming from Syria, 49.7% of the respondents screened positive for at least one of the mental disorders investigated, with 31% suffering from somatization, 21.7% from depression and 34.9% from PTSD. In this study, 44.9% of the participants screened positive for somatization had comorbid depression and as many as 60.3% had comorbid PTSD. Among the participants screened positive for depression, 64.8% were also positively screened for somatization. Regarding the participants with PTSD, this rate was as high as 54.7% (15). These findings suggest that somatization may be an important aspect of trauma, one of the greatest causes of emotional distress (28). Evidence confirming this assumption was found in several refugee samples, for example in 128 Somali refugees in Finland or 1147 traumatized refugees in the Netherlands reporting a positive correlation between somatization and the number of previous traumatic events (22, 29, 30).

In addition to these findings, researchers showed that being female, higher age, having low language proficiency, low economic status, and low education levels are significant and common sociodemographic risk factors for SOD among refugees (17, 30–32). However, factors that have hardly been considered in studies of SOD are acculturative stressors such as discrimination or homesickness. There is little research demonstrating that post-migration stress is associated with somatic symptom severity in refugee samples (e.g. traumatized refugees in Switzerland or Burmese refugees in Australia) (16, 33, 34).

Syrian refugees represent the largest refugee population in Germany and have already been subject of several studies regarding common mental disorders, except for SOD (9, 13, 35, 36). A major result of a qualitative study by our working group on Syrian refugees was evidence of somatization in half of the participants (37). Based on this finding, we expected that SOD occurs frequently in this refugee population. To the best of our knowledge, so far, however, little is known about the specific patterns of SOD among this displaced population in Germany. Particularly the association with post-migration stressors has hardly been examined.

Therefore, the central objective of the present study was to use a register-based approach to report prevalence rates of SOD among Syrian refugees with residence permission in Germany. Additional objectives were to analyze the frequency of single somatic symptoms, to reveal comorbidities with other common mental disorders and to explore the influence of socio-demographic, migration-specific and health variables, post-migration stressors, and common mental disorders on the severity of somatic symptoms.

## Methods

### Data collection and study sample

In 2017, our research team conducted a study among 200 Syrian refugees registered at the job center Erlangen (Germany). About 1.5 years later in 2019, these participants were invited for a second measurement point as part of a longitudinal prospective study on mental health and integration of Syrian refugees in Germany (PROSREF). The presented analysis was carried out as cross-sectional register-based survey within the second measurement point of PROSREF.

Between February and April 2019, the cooperating job center Erlangen informed all Syrian refugees who had already participated in the first measurement point and were still registered at the Job center about the next measurement point by

post. They were invited to attend voluntarily in pre-arranged meetings in a room at the Erlangen city hall. Of the initial 200 participants, 108 still took part and another eight Syrian refugees showed up together with some of the invited participants. Thus, 116 Syrian refugees formed the total study sample for the presented analysis. All participants fulfilled the following criteria: arrival in Germany after 2014, residence in the city of Erlangen, possession of the German residence permission, age above 18, registration at the job center Erlangen, agreement to participate, and a good knowledge of the Arabic language (at least spoken).

All study materials, including information about the study, declaration of consent, privacy policy, and questionnaires, were provided to the participants in Arabic. However, thirteen of the 116 participants (11.2%) could not complete the questionnaire on their own and asked for help from an Arabic-speaking study team member. After completing the questionnaires, all participants received a shopping voucher of 20 € as remuneration.

Full details of the data collection and study sample selection as well as non-responder analyses can be found in an earlier publications (9, 38).

### **Instruments**

Well-established, validated self-evaluation instruments assessing acculturative stress and mental health problems as well as a self-developed demographic, migration-specific and health related questionnaire were used for this survey. All questionnaires were translated by independent translators from German into Arabic, back-translated, and combined into a final version to help ensure reliability, validity, and appropriateness for the study population (9, 39).

### **Sociodemographic, migration-specific, and health related variables**

This questionnaire captured information relating to refugees' sociodemographic and migration-specific characteristics, such as duration of stay in Germany or future validity of permit, and information on their health status and medical service utilization.

#### **Acculturative stress**

Acculturative stress was measured using the Barcelona Immigration Stress Scale (BISS) (40). The BISS is a 42-item self-evaluation instrument that measures immigration-related stress. The instrument consists of four subscales: perceived discrimination, intercultural contact stress (e.g. difficulties in the practice of religion), homesickness, and general psychosocial stress (e.g. financial problems) (41). The items are responded to on a 4-point Likert-like scale from 1 (totally disagree) to 4 (totally agree). Higher scores indicate higher levels of acculturative stress. Internal consistency in our sample was measured using Cronbach's Alpha and was shown to be very good ( $\alpha = 0.95$ ).

#### **Somatic distress**

SOD was assessed by the valid and reliable somatic symptom module of the Patient Health Questionnaire (PHQ-15) (42). This somatic symptom severity scale inquires 15 somatic symptoms that account for more than 90% of the physical complaints (excluding upper respiratory tract symptoms) reported in the outpatient setting (43). One of the items, asking for menstrual pain and problems, was only meant for female participants. Subjects are asked how much each of the 15 symptoms bothered them on a 3-point Likert scale ranging from 0 (not bothered at all), over 1 (bothered a little), to 2 (bothered a lot), during the past four weeks. Thus, the total score ranges from 0 to 30, with higher scores indicating greater severity of somatic symptoms. The total score classified to the four levels of SOD as minimal (score  $\leq 4$ ), mild (score  $\geq 5$ ), moderate (score  $\geq 10$ ), and severe (score  $\geq 15$ ) (44). The cut-off score of 10 was adopted to separate participants with high or low SOD, since it was identified as optimal for predicting the diagnosis of somatoform disorder (45). We also added a cut-off score of 6 to identify participants being at risk for SOD (17, 31, 46). Furthermore, participants were asked how much these symptoms caused difficulties in doing their work, their household and interacting with people on a 4-point scale from 0 (not difficult at all) to 3 (very difficult). Internal consistency in this sample was good (Cronbach's  $\alpha = 0.88$ ).

#### **Depressive Symptoms**

Severity of depressive symptoms was measured by the self-administered nine item depression subscale of the Patient Health Questionnaire (PHQ-9) (47). It assesses the presence of the nine DSM criteria for major depression within the last two weeks. PHQ-9 scores range from 0 to 27 with scores of 10 or higher indicating clinically relevant depressive symptoms. Cronbach's Alpha in this sample was 0.87.

### **Anxiety symptoms**

The 7-item Generalized Anxiety Disorder Scale (GAD-7) is used as a self-rating screening tool and severity measure of various anxiety symptoms (48). Scores range from 0 to 21 with higher scores representing higher levels of anxiety. The cut-off for clinically relevant anxiety symptoms is at score 10 or higher (Cronbach's  $\alpha$  in this sample = 0.92).

### **Traumatic Events and PTSD**

The Essen Trauma Inventory (ETI, Arabic version) captures experienced traumatic events and posttraumatic symptomatology according to DSM-IV (49). This self-evaluation questionnaire assesses the type and amount of experienced traumatic events using a trauma list consisting of 14 potentially traumatic events, such as war experience, and an open category. For the worst traumatic event they had experienced, the participants answer questions about objective and subjective danger to life (A1 and A2 criterion). The scale also includes a 17-item PTSD symptom list covering intrusion, avoidance, and hyperarousal. Clinically apparent PTSD is indicated if a participant has experienced at least one traumatic event, meets criteria A1 and A2, and if the total score for the PTSD symptom list is  $\geq 27$ . Cronbach's Alpha in the present study sample was 0.95.

### **Statistical Analysis**

All data analyses were carried out by means of IBM SPSS Statistics 21 (IBM Corporation, Armonk, New York). Missing records in the questionnaires were replaced by the expectation maximization method (max. 20% missing data accepted). For descriptive statistics, we depicted means, standard deviations, ranges and frequencies. Prevalence rates for mental disorders were calculated based on established cut-off scores. In order to equalize the conditions of the PHQ-15 questionnaire for differences in gender, we additionally calculated a sum score excluding the menstruation item (PHQ-15\*). Differences between groups (men/women, low/high SOD) were analyzed using t-tests for continuous variables and Chi-squared or Fisher exact tests for categorical data. An analysis of covariance was calculated to investigate the differences in degree of SOD in relation to gender and controlling for age. Pearson and Spearman correlation coefficients were computed to examine correlations between SOD with specific variables and instruments. After checking the required assumptions, multiple linear block wise regression analyses were calculated to explore the influence of sociodemographic characteristics, migration-specific characteristics, health care utilization, and specific mental disorders on the severity of somatic symptoms. In order to measure the effect sizes, we computed Cohen's  $d$  and Cramer's  $V$ . For Cohen's  $d$ , small effect sizes can be assumed if  $d \geq 0.2$ , medium effect sizes if  $d \geq 0.5$ , and large effect sizes if  $d \geq 0.8$ . For Cramer's  $V$  it is:  $V \geq 0.1$  = small,  $V \geq 0.3$  = medium, and  $V \geq 0.5$  = large effect size (50). A level of significance was predetermined at  $p \leq 0.05$  for all analyses.

## **Results**

### **Sample characteristics**

The presented study sample consisted of 116 Syrian refugees (31.0% women) living in Germany for an average of 41.51 months (3.5 years). Their average age at the time of the survey was 36.7 years (SD = 10.9; Range: 19–64). Table 1 shows the socio-demographic and migration-specific characteristics of the total study sample as well as stratified by gender and SOD severity. There were no significant differences in sociodemographic and migration-specific characteristics between participants with low and high SOD, except for the amount of traumatic experiences and acculturative stress. Participants with high SOD reported significantly more experienced traumatic events ( $M = 3.82$ ,  $SD = 3.09$ ) than participants with low SOD ( $M = 2.59$ ,  $SD = 2.34$ ;  $t = -1.97$ ,  $p = .025$ ,  $d = .485$ ). Furthermore, the mean value of experienced acculturative stress was 1.88 (SD = 0.59; Range: 1–4), indicating ratings oscillating between totally disagree and moderately disagree. The ratings of both homesickness ( $M = 2.44$ ;  $SD = 0.81$ ) and general psychosocial stress ( $M = 2.13$ ;  $SD = 0.71$ ) ranged between moderately disagree and moderately agree. Intercultural contact stress ( $M = 1.67$ ;  $SD = 0.59$ ) and perceived discrimination ( $M = 1.77$ ;

0.70) were both rated lower than the mean acculturative stress score. Participants in the high SOD group differed significantly from the participants in the low SOD group in terms of general psychosocial stress (High SOD:  $M = 2.42$ ,  $SD = 0.59$ ; Low SOD:  $M = 2.04$ ,  $SD = 0.72$ ;  $t = -2.57$ ,  $p = .012$ ,  $d = .550$ ) and homesickness (High SOD:  $M = 2.79$ ,  $SD = 0.71$ ; Low SOD:  $M = 2.33$ ,  $SD = 0.81$ ;  $t = -2.68$ ,  $p = .008$ ,  $d = .584$ ).

Table 1

Sociodemographic and migration-specific characteristics of the total sample and stratified by gender and SOD severity ( $N=116$ )

	Total ( $N=116$ )		Male ( $n=80$ )		Female ( $n=36$ )		Low SD <sup>1</sup> ( $n=88$ )		High SD <sup>2</sup> ( $n=28$ )	
	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>
<b>Age group</b>										
18–24	16	13.8	14	17.5	2	5.6	15	17.0	1	3.6
25–44	75	64.7	52	65.0	23	63.9	54	61.4	21	75.0
≥ 45	25	21.6	14	17.5	11	30.6	19	21.6	6	21.4
<b>Marital status</b>										
Single	34	29.3	34	42.5	0	0.0	32	36.4	2	7.1
Married/in a relationship	77	66.4	45	56.3	32	88.9	53	60.2	24	85.7
Divorced/Widowed	5	4.3	1	1.3	4	11.1	3	3.4	2	7.1
<b>Current activities<sup>b</sup></b>										
School/Studies	17	14.7	15	18.8	2	5.6	15	17.0	2	7.1
Employment <sup>c</sup>	47	40.5	40	50.0	7	19.4	37	42.0	10	35.7
<b>Family in crisis areas<sup>d</sup></b>										
	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>
	<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>	
<b>Education in years</b> ( $n=115$ )	10.80 (5.47)	0–30	11.51 (5.28)	0–30	9.25 (5.62)	0–20	10.55 (5.87)	0–30	11.57 (3.40)	6–20
<b>Duration of stay in Germany<sup>e</sup></b> ( $n=114$ )	41.51 (7.33)	9–67	42.27 (6.90)	9–67	39.80 (8.12)	18–67	41.71 (7.16)	9–67	40.85 (7.99)	18–67
<b>Future validity of permit<sup>e</sup></b> ( $n=114$ )	9.80 (10.37)	-2–35	9.76 (10.36)	-2–35	9.89 (10.57)	-2–35	9.57 (10.13)	-2–35	10.50 (11.25)	-2–35
<b>German language skills<sup>f</sup></b>	2.30 (1.03)	0–4	2.51 (1.02)	0–4	1.83 (0.91)	0–3	2.39 (1.07)	0–4	2.04 (0.88)	0–4
<b>Number of experienced traumatic events</b>	2.87 (2.59)	0–12	3.19 (2.74)	0–12	2.17 (2.06)	0–8	2.59 (2.34)	0–12	3.82 (3.09)	0–11
<b>Acculturative stress (BISS)</b>										

\*Add-ups may not be equal to total due to rounding; <sup>a</sup> Valid values; <sup>b</sup> Multiple answers possible; <sup>c</sup> full-time, part-time or marginal employment; <sup>d</sup> Family members currently living in crisis areas; <sup>e</sup> in months; <sup>f</sup> Self-evaluation on a scale from 0 (no skills) to 4 (very good skills); <sup>g</sup> BISS = Barcelona Immigration Stress Scale; <sup>1</sup> Low somatic distress is defined as minimal or mild somatic symptoms score (PHQ-15 score < 10); <sup>2</sup> High somatic distress is defined as moderate or severe somatic symptoms score (PHQ-15 score ≥ 10)

	Total (N= 116)		Male (n= 80)		Female (n= 36)		Low SD <sup>1</sup> (n= 88)		High SD <sup>2</sup> (n= 28)	
	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>
Perceived discrimination	1.77 (0.70)	1-4	1.77 (0.66)	1-4	1.75 (0.77)	1-4	1.72 (0.67)	1-4	1.92 (0.77)	1-4
Intercultural contact stress	1.67 (0.59)		1.67 (0.55)		1.67 (0.68)		1.62 (0.58)		1.84 (0.60)	
General psychosocial stress	2.13 (0.71)		2.13 (0.68)		2.13 (0.76)		2.04 (0.72)		2.42 (0.59)	
Homesickness	2.44 (0.81)		2.35 (0.72)		2.64 (0.96)		2.33 (0.81)		2.79 (0.71)	
Total score	1.88 (0.59)		1.88 (0.55)		1.90 (0.67)		1.82 (0.58)		2.08 (0.57)	

\*Add-ups may not be equal to total due to rounding; <sup>a</sup> Valid values; <sup>b</sup> Multiple answers possible; <sup>c</sup> full-time, part-time or marginal employment; <sup>d</sup> Family members currently living in crisis areas; <sup>e</sup> in months; <sup>f</sup> Self-evaluation on a scale from 0 (no skills) to 4 (very good skills); <sup>g</sup> BISS = Barcelona Immigration Stress Scale; <sup>1</sup> Low somatic distress is defined as minimal or mild somatic symptoms score (PHQ-15 score < 10); <sup>2</sup> High somatic distress is defined as moderate or severe somatic symptoms score (PHQ-15 score ≥ 10)

### Health characteristics and health care utilization

From this sample, 85.3% reported at least one medical appointment within the last 12 months and 11.2% even reported more than ten appointments (Table 2). Considering only the participants with high SOD, this percentage was as high as 21.4%, compared to 7.9% for the participants with low SOD ( $\chi^2 = 6.33$ ,  $p = .042$ ,  $V = .055$ ). In addition, 16.6% of the participating women went to a doctor more than ten times in the past year (men: 8.8%). In this respect, women consulted a doctor significantly more often than men did ( $\chi^2 = 12.33$ ,  $p = .011$ ,  $V = .399$ ).

Table 2  
Health characteristics of the total sample and stratified by gender and SOD severity (N= 116)

	Total (N= 116)		Male (n= 80)		Female (n= 36)		Low somatic distress <sup>1</sup> (n = 88)		High somatic distress <sup>2</sup> (n = 28)	
	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>	n	% <sup>a*</sup>
<b>Medical visits in the last 12 months</b>										
Yes	99	85.3	64	80.0	35	97.2	71	80.7	28	100.00
No	17	14.7	16	20.0	1	2.8	17	19.3	0	0.0
1–2 times	27	23.3	23	28.7	4	11.1	23	26.1	4	14.3
3–5 times	39	33.6	26	32.5	13	36.1	29	33.0	10	35.7
6–10 times	19	16.4	7	8.8	12	33.3	12	13.6	7	25.0
11–20 times	7	6.0	4	5.0	3	8.3	3	3.4	4	14.3
More than 20 times	6	5.2	3	3.8	3	8.3	4	4.5	2	7.1
<b>Chronic diseases</b>										
Yes	16	13.8	9	11.3	7	19.4	18	20.5	5	17.9
No	100	65.5	71	88.8	29	80.6	70	79.5	23	82.1
<b>Regular intake of medication</b>										
Yes	29	25.0	14	17.5	15	41.7	18	20.5	11	39.3
No	87	75.0	66	82.5	21	58.3	70	79.5	17	60.7
<b>Previous treatment of mental disorders</b>										
Yes	9	7.8	4	5.0	5	13.9	6	6.8	3	10.7
No	107	92.2	76	95.0	31	86.1	82	93.2	25	89.3
	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>	<b>M</b>	<b>Range</b>
	<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>		<b>(SD)</b>	
<b>Health status<sup>b</sup></b>	2.33	0–4	2.46	0–4	2.02	0–4	2.49	0–4	1.82	0–4
	(0.90)		(0.93)		(0.77)		(0.90)		(0.72)	
<b>Mental health status<sup>b</sup></b>	2.21	0–4	2.35	0–4	1.92	0–4	2.37	0–4	1.70	0–4
	(0.97)		(0.96)		(0.94)		(0.93)		(0.95)	
*Add-ups may not be equal to total due to rounding; <sup>a</sup> Valid values; <sup>b</sup> Self-evaluation on a Scale from 0 (bad) to 4 (excellent); <sup>1</sup> Low somatic distress is defined as minimal or mild somatic symptoms score (PHQ-15 score < 10); <sup>2</sup> High somatic distress is defined as moderate or severe somatic symptoms score (PHQ-15 score ≥ 10)										

Participants with high SOD rated their health status (M = 1.82, SD = 0.72) and their mental health status (M = 1.70, SD = 0.95) lower than participants with low SOD (health status: M = 2.49, SD = 0.90, t = 4.00, p ≤ .001, d = .778; mental health: M = 2.37, SD = 0.93, t = 3.23, p = .002, d = .717). A similar result was found for women in comparison to men. Women rated their health

status ( $M = 2.02$ ;  $SD = 0.77$ ) and their mental health status ( $M = 1.92$ ,  $SD = 0.94$ ) significantly lower than men did (health status:  $M = 2.46$ ,  $SD = 0.93$ ,  $t = -2.63$ ,  $p = .010$ ,  $d = .498$ ; mental health:  $M = 2.35$ ,  $SD = 0.96$ ;  $-2.23$ ,  $p = .028$ ,  $d = .451$ ).

### **Somatic symptoms**

The average severity of somatic symptoms (PHQ-15 score) for the total sample was 6.35 ( $SD = 5.49$ ). Almost half (49.1%) of respondents were at risk of SOD (PHQ-15 score  $\geq 6$ ), 15.5% of respondents showed moderate severity SOD (PHQ-15 score of 10–14), and 8.6% high severity SOD levels (PHQ-15 score  $\geq 15$ ). Women ( $M = 8.94$ ,  $SD = 6.79$ ) experienced significantly higher SOD scores than men did in the past four weeks ( $M = 5.19$ ,  $SD = 4.37$ ;  $t = 3.05$ ,  $p = .004$ ,  $d = .717$ ). Similar distinctions between women and men were found for the risk of SOD, the number of severely distressing symptoms and the somatic symptom severity with medium effect sizes (Table 3). An ANCOVA with severity of somatic symptoms as dependent variable, gender as independent variable and the covariate age also revealed a significant effect of gender ( $F = 11.43$ ,  $p = .001$ ,  $d = .684$ ); the effect for age was not significant ( $F = 1.19$ ,  $p = .278$ ): women had significantly higher age-adjusted mean scores than men (data not shown).

Table 3  
Somatic symptoms causing distress among the total sample and stratified by gender (N= 116)

	Total (N= 116)		Male (n= 80)		Female (n= 36)		Comparison		
	M	SD	M	SD	M	SD	t/ $\chi^2$	p	d
PHQ-15 score	6.35	5.49	5.19	4.37	8.94	6.79	3.05 <sup>8</sup>	.004	.717 <sup>9</sup>
PHQ-15* score <sup>1</sup>	6.11	5.23	5.10	4.18	8.36	6.55	2.75 <sup>8</sup>	.008	.648 <sup>9</sup>
Number of severely distressing symptoms <sup>2</sup>	1.20	2.05	0.80	1.36	2.08	2.90	2.53 <sup>8</sup>	.015	.651 <sup>9</sup>
Impairment in working, housekeeping and interaction with other people <sup>3</sup>	0.67	0.67	0.74	0.65	0.63	0.68	0.83 <sup>8</sup>	.405	.167 <sup>9</sup>
	<b>n</b>	<b>%<sup>a, b</sup></b>	<b>n</b>	<b>%<sup>a, b</sup></b>	<b>n</b>	<b>%<sup>a, b</sup></b>			
<b>Risk of somatic distress<sup>4</sup></b>									
Yes	57	49.1	34	42.5	23	63.9	4.54 <sup>10</sup>	.033	.198 <sup>11</sup>
No	59	50.9	46	57.5	13	36.1			
<b>Somatic distress severity<sup>5</sup></b>									
Minimal	52	44.8	40	50.0	12	33.3	12.06 <sup>12</sup>	.001	.334 <sup>11</sup>
Mild	36	31.0	28	35.0	8	22.2			
Moderate	18	15.5	9	11.3	9	25.0			
Severe	10	8.6	3	3.8	7	19.4			
<b>PHQ-15 symptoms<sup>6</sup></b>									

<sup>1</sup> PHQ-15 score without the menstrual cramps or problems item; <sup>2</sup> Mean number of somatic symptoms rated as “bothered a lot”; <sup>3</sup> Rated on a scale from 0 (“not difficult at all”) to 3 (“very difficult”); <sup>4</sup> A PHQ-15 score of 6 or more classified respondents as being at risk of somatic distress; <sup>5</sup> Severity categories based on PHQ-15 score: minimal (0–4), mild (5–9), moderate (10–14) and severe ( $\geq 15$ ); <sup>6</sup> Somatic symptoms rated as bothering (“bothered a little” or “bothered a lot”); <sup>7</sup> Calculated for female participants only; <sup>8</sup> Independent t-test; <sup>9</sup> Cohen’s d (Hedges’ g); <sup>10</sup> Chi-squared test; <sup>11</sup> Cramer-V; <sup>12</sup> Fisher’s exact test; <sup>a</sup> Valid values; <sup>b</sup> Add-ups may not be equal to total due to rounding

	Total (N=116)		Male (n=80)		Female (n=36)		Comparison		
	M	SD	M	SD	M	SD	t/ $\chi^2$	p	d
Stomach pain	31	26.8	18	22.6	13	36.1			
Back pain	64	55.2	42	52.6	22	61.1			
Pain in arms, legs or joints	65	56.0	42	52.6	23	63.8			
Menstrual cramps or problems <sup>7</sup>	13	11.2	8	10.1	17	47.2			
Pain or problems during sex	55	47.4	36	45.0	5	13.9			
Headaches	35	30.2	18	22.5	19	52.8			
Chest pain	26	22.4	14	17.5	17	47.3			
Dizziness	7	6.1	3	3.8	12	33.4			
Fainting spells	35	30.1	19	23.8	4	11.1			
Heart pounding or racing	48	41.3	27	33.8	16	44.5			
Shortness of breath	37	41.3	22	27.6	21	58.4			
Constipation, nervous bowel, or diarrhea	40	34.5	23	28.8	15	41.7			
Nausea, flatulence or indigestion	60	51.7	36	45.0	17	47.3			
Feeling tired, having low energy	59	50.9	38	47.5	24	66.7			

<sup>1</sup> PHQ-15 score without the menstrual cramps or problems item; <sup>2</sup> Mean number of somatic symptoms rated as “bothered a lot”; <sup>3</sup> Rated on a scale from 0 (“not difficult at all”) to 3 (“very difficult”); <sup>4</sup> A PHQ-15 score of 6 or more classified respondents as being at risk of somatic distress; <sup>5</sup> Severity categories based on PHQ-15 score: minimal (0–4), mild (5–9), moderate (10–14) and severe ( $\geq 15$ ); <sup>6</sup> Somatic symptoms rated as bothering (“bothered a little” or “bothered a lot”); <sup>7</sup> Calculated for female participants only; <sup>8</sup> Independent t-test; <sup>9</sup> Cohen’s d (Hedges’ g); <sup>10</sup> Chi-squared test; <sup>11</sup> Cramer-V; <sup>12</sup> Fisher’s exact test; <sup>a</sup> Valid values; <sup>b</sup> Add-ups may not be equal to total due to rounding

	Total (N= 116)		Male (n= 80)		Female (n= 36)		Comparison		
	M	SD	M	SD	M	SD	t/χ <sup>2</sup>	p	d
Trouble sleeping					21	58.3			

<sup>1</sup> PHQ-15 score without the menstrual cramps or problems item; <sup>2</sup> Mean number of somatic symptoms rated as “bothered a lot”; <sup>3</sup> Rated on a scale from 0 (“not difficult at all”) to 3 (“very difficult”); <sup>4</sup> A PHQ-15 score of 6 or more classified respondents as being at risk of somatic distress; <sup>5</sup> Severity categories based on PHQ-15 score: minimal (0–4), mild (5–9), moderate (10–14) and severe (≥ 15); <sup>6</sup> Somatic symptoms rated as bothering (“bothered a little” or “bothered a lot”); <sup>7</sup> Calculated for female participants only; <sup>8</sup> Independent t-test; <sup>9</sup> Cohen’s d (Hedges’ g); <sup>10</sup> Chi-squared test; <sup>11</sup> Cramer-V; <sup>12</sup> Fisher’s exact test; <sup>a</sup> Valid values; <sup>b</sup> Add-ups may not be equal to total due to rounding

For the total sample, the most distressing symptoms (estimated as “bothered a lot”) were back pain (22.4%), pain in arms, legs, or joints (17.2%), nausea, flatulence or indigestion (13.8%), and trouble sleeping (12.1%). Women reported back pain (25.0%), headaches (22.2%), trouble sleeping (22.2%), and pain in arms, legs, or joints (19.4%) as the most bothering symptoms. For men, these were back pain (21.3%), pain in arms, legs, or joints (16.3%), nausea, flatulence or indigestion (12.5%), and trouble sleeping (7.5%). The prevalence rates for all bothering symptoms (“bothering a little” and “bothering a lot”) are depicted in Table 3.

In addition, participants reporting high SOD (M = 1.12, SD = 0.71) had significantly more difficulties in working, housekeeping and interaction with other people than participants reporting low SOD severity (M = 0.53, SD = 0.59; t = -3.82, p ≤ .001, d = .951; data not shown).

#### Comorbidity between somatic distress and other common mental disorders

Of the total sample, 24.1% achieved moderate to severe levels of SOD (PHQ-15 score ≥ 10), 30.2% experienced clinically relevant symptoms of depression (PHQ-9 score ≥ 10), 15.5% were screened positive for anxiety (GAD-7 ≥ 10), and 12.1% fulfilled the criteria of a PTSD diagnosis (ETI score). For 75.0% of participants with moderate to severe levels of somatic distress we revealed comorbid PHQ-9 levels of 10 or higher, 46.0% comorbid GAD-7 levels of 10 or higher and 28.6% comorbid clinically relevant PTSD symptoms (Fig. 1). A detailed distribution of the four severity levels of somatic symptoms by these three mental disorders is given in Table 4.

**Figure 1.** Comorbidities of somatic distress with depression, anxiety, and PTSD among the total sample (N= 116)

Table 4  
The severity of somatic distress stratified by common mental disorders of the total sample (N= 116)

	Severity of somatic distress (n, %)			
	Minimal	Mild	Moderate	Severe
<b>Depression (PHQ-9 score)<sup>a</sup></b>				
No (< 10)	49 (42.2)	25 (21.6)	6 (5.2)	1 (0.9)
Yes (≥ 10)	3 (2.6)	11 (9.5)	12 (10.3)	9 (7.8)
<b>Anxiety (GAD-7 score)<sup>b</sup></b>				
No (< 10)	52 (44.8)	31 (26.7)	14 (12.1)	1 (0.9)
Yes (≥ 10)	0 (0.0)	5 (4.3)	4 (3.4)	9 (7.8)
<b>PTSD (ETI score)<sup>c</sup></b>				
No	31 (26.7)	23 (19.8)	11 (9.5)	3 (2.6)
Yes	2 (1.7)	4 (3.4)	3 (2.6)	5 (4.3)
<sup>a</sup> PHQ-9, Patient Health Questionnaire – Depression Module total score; <sup>b</sup> GAD-7, Generalized Anxiety Disorder total score; <sup>c</sup> ETI, Essen Trauma Inventory: sum score calculated only for participants with at least one traumatic experience on the basis of the three subscales (intrusion, hyperarousal and avoidance) that are relevant for the cut-off for a PTSD diagnosis				

#### Associations between somatic distress with sociodemographic, migration-specific, and health characteristics, and common mental disorders

To choose the most suitable variables for the inclusion in our regression analysis predicting SOD, we first conducted Pearson and Spearman correlations. Among others, SOD was strongly associated with all three examined mental disorder scores: depression ( $r = 0.70, p \leq .001$ ), anxiety ( $r = 0.64, p \leq .001$ ), and PTSD ( $r = .29, p \leq .001$ ). All significant correlations with SOD are presented in Additional file 1 and were included in the following multiple block wise regression analyses. These regression analyses were conducted to examine the influence of the selected sociodemographic, migration-specific and health related variables on the severity of somatic symptoms of the total sample (Table 5). Model 1 ( $F_{(3,112)} = 8.104, p \leq .001$ ) included only sociodemographic variables (age, gender) and the number of medical visits in the past 12 months as predictors and revealed female gender ( $\beta = -.21, p = .026$ ) and a higher number of medical visits ( $\beta = 0.28, p = .003$ ) to be associated with greater somatic symptom severity. In Model 2 ( $F_{(4,111)} = 10.336, p \leq .001$ ) traumatic experiences were added and shown to be positively associated with greater SOD ( $\beta = 0.32, p \leq .000$ ) besides female gender ( $\beta = -0.29, p = .001$ ) and higher number of medical visits ( $\beta = 0.23, p = .010$ ). Adding post-migration stressors to Model 3 ( $F_{(7,108)} = 7.593, p \leq .001$ ) displayed the following significant predictors: female gender ( $\beta = 0.28, p = .014$ ), higher number of medical visits ( $\beta = 0.22, p = .018$ ), more traumatic experiences ( $\beta = 0.27, p = .003$ ), and general psychosocial stress ( $\beta = 0.37, p = .004$ ). The additional inclusion of common mental disorders (depression, anxiety, and PTSD symptoms) to the final Model 4 ( $F_{(10,105)} = 18.913, p \leq .001$ ) indicated that among these adjustments, higher number of medical visits ( $\beta = 0.15, p = .034$ ), higher depression values (PHQ-9;  $\beta = 0.45, p \leq .001$ ), and higher anxiety scores (GAD-7;  $\beta = 0.31, p = .002$ ) were significantly associated with increased somatic symptomatology. The explained variance evolved from 15.6% in Model 1, over 24.5% in Model 2 and 28.6% in Model 3 to 60.9% in Model 4.

Table 5  
Multiple block wise linear regression analyses predicting the severity of somatic distress (N= 116)

Included variables	Significant predictors <sup>1</sup>	B <sup>2</sup>	95% CI <sup>3</sup>	SE <sup>4</sup>	$\beta$	p
<b>Model 1</b> (R <sup>2</sup> <sub>adj.</sub> = 0.156) <sup>5</sup> : gender, age, and number of medical visits	Gender <sup>a</sup>	-2.464	-4.622 to -.305	1.089	-.208	.026
	Number of medical visits	1.176	.415 to 1.938	.384	.281	.003
<b>Model 2</b> (R <sup>2</sup> <sub>adj.</sub> = 0.245) <sup>5</sup> : gender, age, number of medical visit, and traumatic experiences	Gender <sup>a</sup>	-3.470	-5.579 to -1.361	1.065	-.293	.001
	Number of medical visits	.962	.232 to 1.691	.368	.230	.010
	Traumatic experiences	.680	.322 to .1.038	.181	.320	.000
<b>Model 3</b> (R <sup>2</sup> <sub>adj.</sub> = 0.286) <sup>5</sup> : gender, age, number of medical visits, traumatic experiences, intercultural contact stress, homesickness, and general psychosocial stress	Gender	-3.419	-5.507 to -1.332	1.053	-.289	.002
	Number of medical visits	.900	.158 to 1.642	.374	.215	.018
	Traumatic experiences	.565	.121 to 5.507	.189	.266	.003
	General psychosocial stress	2.888	.926 to 4.850	.990	.370	.004
<b>Model 4</b> (R <sup>2</sup> <sub>adj.</sub> = 0.609) <sup>5</sup> : gender, age, number of medical visits, traumatic experiences, intercultural contact stress, homesickness, general psychosocial stress, depression score <sup>6</sup> , anxiety score <sup>7</sup> , and PTSD score <sup>8</sup>	Number of medical visits	.605	.047 to 1.162	.281	.145	.034
	Anxiety score	.358	.132 to .584	.114	.308	.002
	Depression score	.451	.254 to .647	.099	.450	.000
<sup>1</sup> Significant predictors of the PHQ-15 sum score; <sup>2</sup> B = regression coefficient; <sup>3</sup> CI = confidence interval; <sup>4</sup> SE = standard error; <sup>5</sup> Explanation of variance; <sup>6</sup> Measured by the PHQ-9 sum score; <sup>7</sup> Measured by the GAD-7 sum score; <sup>8</sup> Measured by the ETI sum score; <sup>a</sup> 0 = female, 1 = male						

## Discussion

Due to the worldwide high number of refugees in recent years, the mental health of different refugee populations has become the focus of many researchers in numerous receiving countries. However, the vast majority of this research focused on the three most common mental disorders depression, anxiety, and PTSD (3, 11, 12). In Germany, the western country with the most accepted recognized refugees, is still a lack of data on SOD among the hosted refugees (51). Particularly Syrians, the

largest refugee population in Germany, have surprisingly hardly been considered in studies on somatic symptoms. To the best of our knowledge, this is the first register-based study to report on the patterns of SOD in Syrian refugees with residence permission in Germany. The results of our study highlight the great burden of somatic symptoms among Syrian refugees in Germany and the strong association between this burden with pre- and post-migration factors and with other common mental disorders. The revealed increased medical service utilization among somatically strained Syrian refugees should alert both policy makers and health care providers to this highly vulnerable group.

#### *Health characteristics and health care utilization*

In this regard, 85.3% of our study sample had at least one medical visit in the last 12 months, 6.0% had 11 to 20 appointments and 5.2% even had more than 20 appointments. Participants in the high SOD group ( $PHQ \geq 10$ ) reported significantly higher medical service utilization than participants in the low SOD group. Although the number of visits to the doctor may be partly attributed to the SOD severity and be an indication of somatization, it must also be taken into consideration that the number of visits per person in Germany is well above the international average. The average German population has 9.9 medical appointments per year, while the international average is at 6.8 visits (52). This may have led to the Syrian refugees adapting to the practices of the German health system. Unfortunately, to our knowledge, such a statistic doesn't exist for the Syrian health system since an outpatient health insurance is not established so far (53). Of the total sample, 13.8% reported chronic diseases and 25% the regular intake of medication, which may lead to the need of medical treatment. In a study among Syrian refugees in Turkey, 39% of the sample stated living with a chronic illness or disability being associated with the severity of increased SOD (17). In contrast to the high percentage of health care utilization, only 7.8% of the sample admitted to previous treatment of mental disorders. Among the respondents with high SOD, the percentage was a little higher at 10.7%. This could possibly be related to the assumption that refugees prefer to be referred to medical services, rather than to psychiatric institutions, as they have limited knowledge and awareness of mental health or they fear stigmatization by the doctor, their family, or compatriots (54). Language barriers as well as a limited understanding of the German mental health care system may also be reasons for the limited use of these services (14). Given the high proportion of detected mental disorders among this refugee sample in Germany, a gap in mental health treatment becomes apparent at this point.

#### *Prevalence of somatic symptoms and somatic distress*

The mean PHQ-15 score in our sample was 6.35 and thus lower than in the Syrian refugee sample in Turkey ( $M = 8.9$ ) or a sample among internally displaced persons in Ukraine ( $M = 7.4$ ) but higher than in conflict-affected persons in the Republic of Georgia ( $M = 5.39$ ) (17, 31, 46). Most frequently, participants reported pain in arms, legs and joints, back pain, and headaches. This is fully consistent with the results of a systematic review among chronic pain in refugees with PTSD (55). Further, almost half of the participants (49.1%) were at least at risk of SOD which is in line with previous studies among SOD in refugees (17, 31). However, one in four respondents of the presented study (24.1%) experienced moderate to severe SOD which is much less than in comparable research using the PHQ-15 in a Syrian refugee sample in Turkey (43%) (17). In contrast, in a study among Kosovar civilian war survivors only 12.9% of participants met the criteria for SOD (56). More similar prevalence rates to our results have been reported in studies of conflict-affected adults in Georgia with 18%, 31% in the Ukraine and a study among refugees recently arrived in Germany with 31% suffering from somatization (15, 31, 46). In the German general population however, the prevalence of somatization at a moderate to severe level is considerably lower, at 9.3% (57). There are many possible explanations for this discrepancy. One explanation may be that yet unknown somatic diseases based on traumatic experiences such as torture or war injuries lead to somatic complaints (14). Another explanation for the cultural differences in SOD attributes the higher somatization prevalence of collectivistic cultures, which include the Arabic countries, to the greater tendency to express psychological distress as somatic sensations which are socially and culturally accepted (58).

As an additional finding, somatically high distressed participants reported significantly more difficulties in working, housekeeping, and interaction with other people than participants with low SOD. That indicates the high impact of SOD on

the general well-being and quality of life of those affected.

### *Comorbidities of somatic distress with other common mental disorders*

Besides the detected high somatic distress levels, clinically relevant scores of depression were found in 30.2%, anxiety in 15.5%, and PTSD in 12.1% of the participants. These findings are in line with previous research that has observed high prevalence rates of mental disorders among Syrian refugees, despite the fact that the rates detected in the present study tended to be lower (e.g. 40.2% of depression, 31.8% of anxiety, and 29.9% of PTSD in Tinghög et al. (2017) (59)). A striking finding of our study was the high comorbidity between SOD and the other common mental disorders. Among the participants screened positive for SOD, 75% showed comorbid depression, 46% comorbid anxiety, and 28.6% showed comorbid PTSD. For the comorbidity with depression, this percentage was higher than in a general refugee sample in Germany (44.9%) but much lower for the comorbidity with PTSD (60.3%) (15). No conclusive statement can be made about a comorbid anxiety disorder among refugees with high SOD. To the best of our knowledge, no previous studies among refugees have reported on that. However, there is striking evidence among previous research on the strong association of SOD with depression, PTSD, and anxiety among refugees (17, 31, 60).

### *Risk factors for increased somatic distress*

In our study, increased SOD was significantly associated with all other three captured mental disorders. Besides the strong association with mental disorders, we also found significant correlations of SOD with female gender, higher age, the amount of health care utilization in the past 12 months, the amount of traumatic experiences, and the post-migration stress factors homesickness, intercultural contact stress, and general psychosocial stress. For most of these factors we found similar results in previous research on several refugee populations, including samples of conflict-affected Ukrainians, recently arrived refugees in Germany, traumatized refugees in Switzerland, Kosovar civilian war survivors, and Syrian refugees in Turkey (15, 17, 31, 32, 56). Only information on the connection between SOD and post-migration living difficulties of refugees is widely missing in existing studies.

Furthermore, multiple block wise regression analyses revealed the extent of health care utilization, anxiety symptoms and depression symptoms to be the most robust predictors for the severity of somatic symptoms when adjusted for sociodemographic, migration-specific, and other critical variables. This analysis proved the strong impact of comorbid mental disorders on SOD as their inclusion to the regression model increased the explained variance from 28.6–60.9%. Without the adjustment for mental disorders, female gender, amount of health care utilization, experienced traumatic events, and general psychosocial stress (e.g. financial problems or feeling alone) were shown to be significant predictors of the severity of somatic symptoms. It was striking that the influence of post-migratory general psychosocial stress on SOD was greater than that of traumatic experiences. All predictors have already been found in different samples of refugees and host countries except for the concept of general psychosocial stress (14, 17, 22, 31). Instead, however, parts of this construct, such as bad economic status, have already been identified as risk factors for SOD (31, 46).

At this point, we would like to highlight the identified risk factor of female gender. In our study sample, women experienced significantly higher scores of SOD than men and reported significantly more severely distressing symptoms. In addition, women consulted medical services significantly more often than men and rated their health status as well as their mental health status significantly lower than men did. In this respect, women represent a highly vulnerable group among Syrian refugees and have to be specifically addressed by mental health services.

## **Strengths, limitations, and implications**

A major strength of this study was the register-based approach to assess patterns of SOD. To the best of our knowledge, this was the first study to explore the specific characteristics, co-occurrences, and risk factors of SOD among Syrian refugees in Germany. Especially the inclusion of acculturative stressors represents a rarity in the investigation of SOD in refugee populations. In addition, a broad range of mental disorders was taken into account using well-established, valid instruments,

which allowed the calculation of different comorbidities. Another advantage was the investigation of a normal population, not a clinical sample. It should also be highlighted that the questionnaires were presented in the mother tongue and the subjects had a chance to ask questions in their mother tongue.

However, an important limitation of this study was the missing of information on diagnosed diseases or disabilities apart from chronic diseases. A medical examination of the participants would have been even better. The PHQ-15 screening instrument for the severity of somatic symptoms is not suitable to distinguish between symptoms that are physically or psychologically explained (61). In this respect there was no opportunity for a medical explanation of physical symptoms and advances the possibility that our findings overrepresented the true levels of SOD in our study population. Another problem, relating to the PHQ-15 is the different cut-off scores used in previous research for detecting SOD or somatization (e.g. PHQ-15 score  $\geq 6$ , or  $\geq 10$ , or the presence of at least three severely bothering somatic symptoms) (17, 31, 44). This complicated the comparability among study results and should be standardized in the future. The fact that different terminology and definitions exist for the construct measured by the PHQ-15 questionnaire also makes a comparison difficult (e.g. SOD, somatic symptom severity, somatization, somatic symptom burden, somatic symptom disorder, or somatoform disorder).

This study follows a cross-sectional design. Longitudinal data is needed to assess temporal relations between SOD with associated factors, such as acculturative stress. Another limitation of our study relates to the lack of generalizability to the general population of Syrian refugees in Germany, since our entire sample is resident in a specific city in Western Germany. It also has to be mentioned that all data was assessed using self-report questionnaires, which can always be a source of bias.

Despite the limitations and the implications for future research mentioned above, our findings have further implications for German policy as well as for health care practice. Key players in health care systems and among the political authorities need to be aware of the strong links between physical and mental health disorders. Mental health problems underlying physical symptoms can lead to chronicity resulting in social withdrawal, lack of ability to integrate, and increased costs of care (14, 62). Therefore, health care professionals should place importance on the differential diagnosis of medically unexplained physical symptoms in refugees. Instead of only focusing on treating specific somatic symptoms, the possibility of underlying mental disorders, traumatization or post-migration stressors should be considered. This would contribute to minimize the risk of misdiagnoses. Due to specific cultural differences and language difficulties, trained interpreters must be provided for medical examinations. In total, there is strong evidence that culturally sensitive and adapted psychological approaches can help in the treatment of SODs and related mental disorders to increase the individual well-being and to reduce the need for medical service utilization (63).

## Conclusions

In addition to previous research highlighting the high levels of PTSD, depression, and anxiety, our study revealed the high prevalence rates of Syrian refugees with residence permission in Germany suffering from SOD. While anyone can suffer from SOD, health care professionals should be particularly vigilant to women, those having experienced traumatic events, reporting psychosocial stress, and those with more severe symptom scores of depression and anxiety. Furthermore, in our sample Syrian refugees bothered by moderate to severe SOD were more likely to frequent health care utilization. An appropriate prevention and treatment of SOD and its related mental health disorders would therefore not only improve the quality of life of those affected but also reduce related health care costs.

## List Of Abbreviations

SOD: Somatic distress; PTSD: Post-traumatic stress disorder; GAD: generalized anxiety disorder; PHQ-9: Patient Health Questionnaire – depression module; PHQ-15: Patient Health Questionnaire – somatic symptom module; GAD-7: Generalized Anxiety Disorder Scale; B: regression coefficient; CI: confidence interval; SE: standard error

## Declarations

### ***Ethics approval and consent to participate***

The study was approved by the Ethics Committee of the Medical Faculty of the Friedrich-Alexander University Erlangen-Nürnberg (FAU) (project identification code: 74\_17 B). All participants gave their written informed consent.

### ***Consent for publication***

Not applicable

### ***Availability of data and materials***

The dataset analyzed during the current study is available from the corresponding author on reasonable request.

### ***Competing interests***

The authors declare that they have no competing interests.

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The funders did not have any further role in the design of the study and collection, analysis, interpretation of data or in writing the manuscript.

### ***Authors' contributions***

AB designed and conducted the study, processed statistical data and drafted the manuscript. GMS enabled and supported the realization of the study. YE supervised and provided feedback and mentorship at each stage of the research design and implementation. EM and YE provided a full review and provision of feedback on the final manuscript. All authors approved the final manuscript.

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## Figures

Comorbidities of participants screened positive for somatic distress (N = 28)

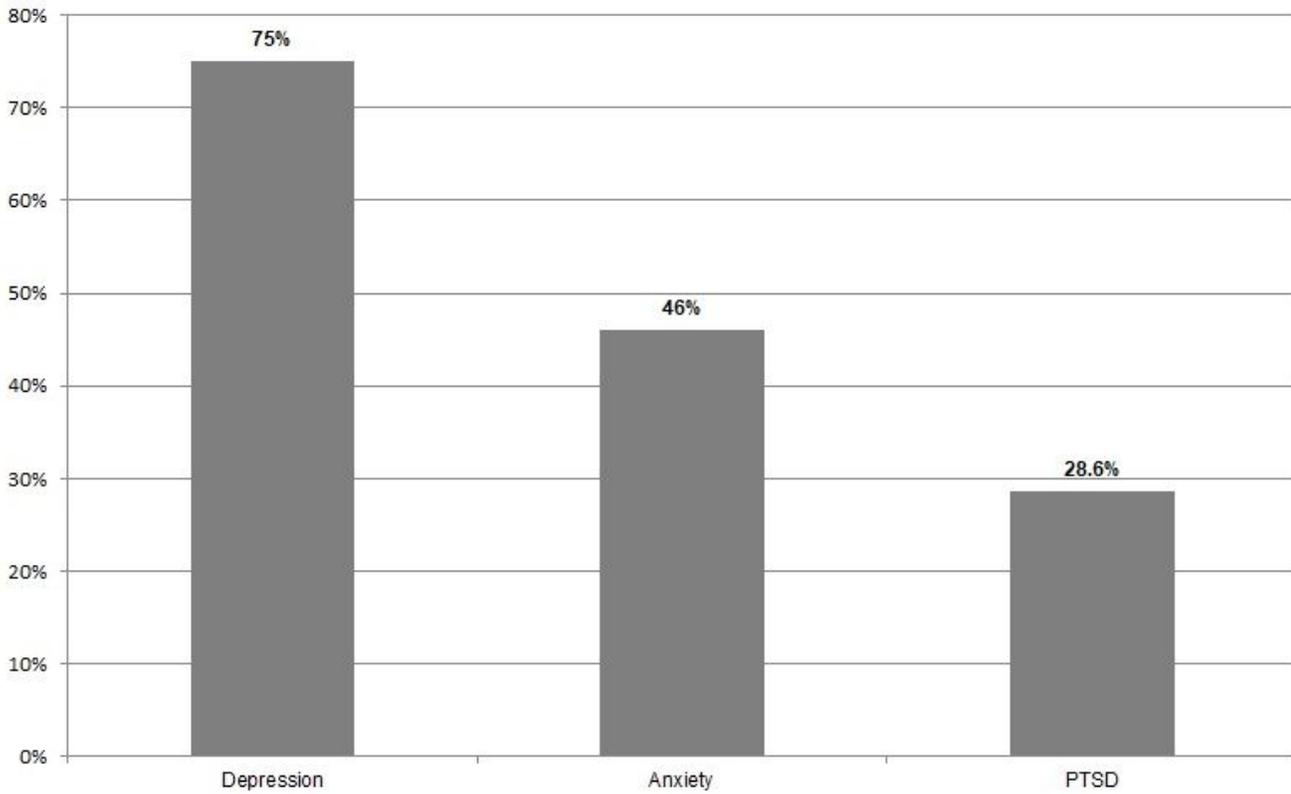


Figure 1

Comorbidities of somatic distress with depression, anxiety, and PTSD among the total sample (N = 116)

## Supplementary Files

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