

Oral health, stress and barriers accessing dental health
care among war-affected Ukrainian refugees in Germany

Von der Medizinischen Fakultät
der Rheinisch-Westfälischen Technischen Hochschule Aachen
zur Erlangung des akademischen Grades
eines Doktors der Zahnmedizin
genehmigte Dissertation

vorgelegt von

Maksym Ponomarenko

aus

Kiew (Ukraine)

Berichter: Univ.-Prof. Dr. med. Andrea Kaifie-Pechmann, M.Sc.
Univ.-Prof. Dr. med. Thomas Kraus

Tag der mündlichen Prüfung : 18.03.2025

Diese Dissertation ist auf den Internetseiten der Universitätsbibliothek online verfügbar.

Ponomarenko M, Kaifie A. Oral health, stress and barriers accessing dental health care among war-affected Ukrainian refugees in Germany. BMC Oral Health. 2023 Oct 27;23(1):804. doi: 10.1186/s12903-023-03513-x. PMID: 37891540; PMCID: PMC10612176.

D 82 (Diss. RWTH Aachen University, 2025)

RESEARCH

Open Access



Oral health, stress and barriers accessing dental health care among war-affected Ukrainian refugees in Germany

Maksym Ponomarenko¹ and Andrea Kaifie^{1*}

Abstract

Background After Russian invasion many Ukrainians fled to European countries including Germany. In this context, the German health care system faced challenges delivering dental care to a displaced population. Recently surfaced obstacles as well as different cultural and medical traits need to be considered in order to deliver appropriate medical care. The aim of this study was to evaluate oral health and hygiene of Ukrainian refugees, identify barriers accessing dental health care and explore the relation to their mental health state.

Methods This cross-sectional study was conducted using a self-assessment questionnaire, distributed via non-probability snowball sampling method among war-affected Ukrainians, who fled to Germany. The online form was distributed via web-based platforms, the printed version was hand-delivered across diverse local venues. Chi-Square Tests, T-Tests and Mann-Whitney-U Tests were performed. Analysis of variance and Spearman correlation coefficient analysis were also conducted.

Results From 819 completed questionnaires, 724 questionnaires were included in the analysis with 78 males (10.8%) and 640 females (88.6%) and a mean age of 37.5 years (SD = 10.5). The majority of participants rated their state of teeth (77%) and gums (81%) as average or better. The main problems, caused by state of their teeth, were: "Have avoided smiling because of teeth" (23.6%) or "Felt embarrassed due to appearance of teeth" (22.2%). The most frequent limiting factors to access dental care were finances (82.6%), language (82.2%) and complicated health care system (74.1%). 45.8% of the participants scored 10 or more in the Patient Health Questionnaire and 37.4% in the Generalized Anxiety Disorder 7-item scale, respectively. These participants were more likely to report pain, poor state of teeth and gums and to fail a dental consultation. Overall, 59.6% participants reported not consulting a dentist, when needed. Failed consultations were associated with a poorer reported state of teeth and gums.

Conclusions Ukrainian refugees reported barriers accessing dental health care in Germany. It is important to improve oral health literacy and dental services for displaced people and provide help and guidance in seeking dental care.

Keywords Unmet needs, Stress, Anxiety, Asylum seeker, Barriers accessing dentist

*Correspondence:

Andrea Kaifie
akaifie@ukaachen.de

¹Institute for Occupational, Social, and Environmental Medicine, Medical Faculty, RWTH Aachen University, Pauwelsstrasse 30, 72074 Aachen, Germany



© The Author(s) 2023. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Background

As a result of various conflicts, wars and violence led to more than 40 million refugees and asylum seekers world- wide at the end of 2022 according to the United Nations Refugee Agency [1]. The ongoing war in Ukraine forced 6.3 million Ukrainian refugees to flee their homes seeking safety as of June 2023 [1]. Germany alone welcomed over 1 million Ukrainian refugees [2]. However, this also created new challenges for the health care system and in particular, for dental care.

Dental care is important for wellbeing and overall health [3]. Impaired oral health is associated with heart disease, mental health problems as well as respiratory infections [4–7]. Therefore, it is essential to maintain adequate dental care for all people, including refugees and asylum seekers. While escaping war and violence they often had only restricted access to basic health care services in their home country or in a country of temporary stay [8]. The level of oral health, awareness of dental hygiene practices and overall level of healthcare knowledge varies across different countries [9]. Therefore, dentists in host countries may be confronted with unique challenges while treating patients from other regions.

Despite successful efforts to welcome and integrate displaced populations, refugees often face various barriers and limitations accessing dental health care [10–16]. Additionally, their priorities throughout the resettlement phase are mainly the integration into the host nation, learning a new language, finding sources of income, and establishing a normal level of life. As a result, dental care and hygiene frequently play a rather subordinate role to other urgent needs. This impacts oral health behavior and results in high caries experiences, untreated teeth and additional complications [17–19]. The understanding of actual needs and barriers could help to identify successful strategies of providing appropriate dental care.

War refugees from Ukraine were able to enter Germany without a visa or residence permit and were allowed to stay for 90 days (until 31.08.2022) without registration [20]. However, if they wanted to stay for a longer period of time or receive social assistance, they needed to apply for a humanitarian residence permit from the immigration office. Before this, Ukrainian refugees were entitled to benefit from the Asylum Seekers Benefits Act (AsylbLG) meaning their access to healthcare was restricted and included only treatment of acute pain and illnesses [21].

Previous studies examining oral health of Ukrainian refugees immigrating to Germany after the beginning of the 2022 war are limited. The aim of this study is to determine the status of oral health among newly arrived refugees, explore their oral health practices, identify barriers and limitations accessing dental care in Germany and

investigate their mental state in relation to oral health problems.

Methods

Study design, participants and data collection

This cross-sectional study took place in North Rhine-Westphalia, Germany between September and December 2022 and included people with Ukrainian citizenship, which fled their home country because of the war. All participants required to be at least 14 years old. Ukrainians, who traveled to Germany before the war, and were not able to get back to Ukraine were also included.

In order to reach more participants, two versions of the questionnaire were distributed: a paper-based and a web-based version, distributed via non-probability snow-ball sampling method. The web-based questionnaire was developed with SoSci Survey (SoSci Survey GmbH, Munich, Germany) and was available online at www.sos-cisurvey.de [22]. Information about the study with a link to the survey was shared on internet resources, related to Ukrainian refugees in different German cities. The paper-based version was distributed personally through local community centers, local organizations and other places of interest, frequently visited by Ukrainians. The investigator, who is fluent in Ukrainian, shared information about the study and offered voluntary participation during the visits. Ethical approval for the study was obtained from the local Ethics Committee of the RWTH Aachen University (EK22-292, 15 September 2022). At the beginning of survey all participants were informed about aim of the study and their anonymity. Participation in this study was voluntary.

Questionnaire development

Our questionnaire consisted of 35 items, including sub-questions, and covered the following general topics:

1. Filter questions.
2. General demographic information.
3. Oral health status and practices.
4. Dental care access.
5. Unmet needs for dental health services.
6. Stress and anxiety measurements.

In this study, mainly already validated tools were used in order to produce standardized data and compare it to other studies [23]. Information on oral health status and practices was based on WHO's (World Health Organization) manual and self-assessment survey "Oral Health Surveys – Basic Methods" [24] in line with different studies regarding oral health [16, 19, 25]. For stress and anxiety measurement, the modules from the Patient Health Questionnaire Somatic, Anxiety, Depressive Symptoms (PHQ-SADS) were used: the 9-items containing Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder 7-item scale (GAD-7). These scales

are well-validated and widely used instruments for the screening and monitoring of depression and anxiety with high sensitivity and specificity [26–30]. A cut-off score of 10 was chosen implying at least moderate depression or anxiety levels. The oral health and barriers part of the questionnaire was translated to the main languages spoken in Ukraine, Ukrainian and Russian. The bilingual investigator checked for cross-language equivalence [31]. PHQ-9 and GAD-7 scales were already available and validated in both languages [32]. The English version of the complete questionnaire can be found in the supplemental section (see **Additional file 1**).

After finalizing, the questionnaire was pilot-tested by a group of 10 Ukrainian participants. Despite of minor grammatical improvements, they reviewed the survey as clear and easy to understand.

At the beginning of the survey, participants had to answer two filter questions: “Are you a Ukrainian citizen?” and “Did you flee to Germany since February 2022?” If both answers were answered with “Yes”, the participant could proceed with the questionnaire.

Demographics included questions about gender, age, marital status, education, language skills, place of residence in Ukraine and in Germany, health insurance, and accompanying family or friends.

The part concerning oral health status and practices included questions about state of teeth and gums, pain experience, oral hygiene practice, visiting a dentist in Ukraine and in Germany, difficulties in everyday life because of teeth, nourishment, smoking and drinking alcohol.

The dental care access part contained ratings of barriers in form of a 6-point Likert scale. After literature research the main barriers, defined in previous qualitative studies [13, 15, 33], were chosen and included for quantitative exploring. These were: language barriers, financial barriers, transport barriers, availability in home region, difficulties understanding dental health care system, difficulties finding a dentist, dental anxiety, trust issues with the dentist, cultural and religious beliefs, social barriers. Moreover, in the unmet needs part, the participants were asked if they failed a consultation, meaning if there was a time when a participant wanted to consult a dentist but did not. Subsequent to this question, the participants could state, which barriers led to this failed consultation.

Statistical analysis

The primary survey data was analyzed using Statistical Analysis System Software (SAS Studio Release 3.8 Enterprise Edition, SAS Institute Inc., Cary, NC, USA). Descriptive statistics were used for all participants in order to describe the most important trends. As a result, frequency analysis was performed for all categorical variables. Medians, interquartile ranges and standard

deviations were calculated for continuous variables. Chi-Square Tests, T-Tests and Mann-Whitney-U Tests were performed. Analysis of variance was performed to describe relation between categorical and continuous variables. Spearman correlation coefficient was used to calculate association between ordinal data. Likert Scales and some other variables were also dichotomized in order to run Chi-Square Tests. Some categorical variables were simplified for statistical analysis. The level of significance was set at 5%.

Results

Sociodemographics

Overall $n = 819$ participants participated in the survey. Altogether, $n = 724$ questionnaires were included in the analysis with $n = 78$ males (10.8%) and $n = 640$ females (88.6%), as described in Table 1. The mean age of the participants was 37.5 years ($SD = 10.5$). Over half of the study participants were married (51.9%; $n = 375$), followed by singles (19.4%; $n = 140$) and divorced (15.9%; $n = 115$). In terms of education, most of the participants (72.6%; $n = 523$) had completed higher education and approximately 17% ($n = 121$) vocational or technical education. Half of the participants rated their level of English as average or better, but only 11.6% ($n = 81$) felt the same way about their German. Most of the refugees came from Eastern Ukraine (38%; $n = 274$) and large cities (66.3%; $n = 478$). Additionally, the majority (82.9%; $n = 599$) arrived in Germany with their families. More than 78% ($n = 568$) of the participants have been staying in Germany for at least 4 months. Less than 9% ($n = 58$) of the participants lacked health insurance in Germany, all other refugees were already insured.

Oral health

The overall reported oral health status was at a good level among the participants. Most of them described the state of their teeth at least average (77%; $n = 542$). The state of gums was slightly better, only 9.1% ($n = 76$) reported poor or very poor gums. Moreover, the participants showed very good oral hygiene practices (Table 2). Most of the participants cleaned their teeth once, twice or more times a day (49.9%; $n = 357$ and 44.4%; $n = 318$ respectively) with toothbrush (98.3%; $n = 318$) and toothpaste (99.9%; $n = 712$). Although around 45% ($n = 305$) of the participants used tooth paste with fluoride, 41% ($n = 281$) did not know if their toothpaste contained fluoride and 14% ($n = 97$) did not use fluoride tooth paste. The most frequent additional tooth cleaning products were floss (40%; $n = 284$) and toothpick (22.3%; $n = 160$).

Regarding food habits, fresh fruits were popular. More than half of participants ($n = 346$; 50.5%) reported to consume them every day or more often. 36.2% ($n = 248$) ate fresh fruits several times a week and only 3.2% ($n = 22$) ate

Table 1 Sociodemographic information about the participants

Sex (n (%))		Age (mean (SD))	
Female	640 (88.6)	37.5 (10.5)	
Male	78 (10.8)		
Diverse	4 (0.6)		
Marriage status (n (%))		Education (n (%))	
Married	375 (51.9)	Higher Education	523 (72.6)
Single	140 (19.4)	Vocational or technical education	121 (16.8)
Divorced	115 (15.9)	General secondary education	59 (8.2)
In a relationship	77 (10.6)	Other	17 (2.4)
Widowed	16 (2.2)		
Level of English (n (%))		Level of German (n (%))	
Very poor	164 (24)	Very poor	412 (58.9)
Poor	174 (25.5)	Poor	206 (29.5)
Average	213 (31.2)	Average	58 (8.3)
Good	88 (12.9)	Good	14 (2)
Very good	44 (6.4)	Very good	9 (1.3)
Home region in Ukraine (n (%))		Size of home city in Ukraine (n (%))	
Eastern Ukraine	274 (38)	Large city	478 (66.3)
Central Ukraine	257 (35.6)	Medium city	131 (18.2)
Southern Ukraine	134 (18.6)	Small city	82 (11.4)
Western Ukraine	56 (7.8)	Village or urban-type village	30 (4.1)
Came alone or with family? (n (%))		Size of city in Germany (n (%))	
With family members	599 (82.9)	Large city	238 (33.2)
Alone	87 (12)	Medium city	235 (32.7)
With friends / acquaintances	29 (4)	Small city	141 (19.6)
With other people	8 (1.1)	Village or urban-type village	104 (14.5)
Time in Germany (n (%))		Insurance (n (%))	
1–2 months	50 (6.9)	No	58 (8.2)
3–4 months	85 (11.8)	Yes	646 (91.8)
4–6 months	345 (47.8)		
Less than 1 month	19 (2.6)		
More than 6 months	223 (30.9)		

them seldom or never ate them. Sweets or candies were mostly consumed several times a week. When the participants were asked if they smoke cigarettes, the majority reported (74.8%; $n = 511$) to have never smoked.

A significant predictor for oral health was education. Participants with a higher education reported a better state of teeth (mean 3.4 (SD 1.0)) and gums (mean 3.8 (SD 1.1)) compared to other participants (mean 2.8 (SD 1.2) and mean 3.5 (SD 1.1)), respectively. In addition, participants with higher education more often visited a dentist for a dental check-up routine (69.3%; $n = 377$).

Most of the participants ($n = 521$; 76.2%) were visiting a dentist at least once a year. However, around 79% ($n = 558$) have suffered from pain, caused by teeth or mouth, within the last 12 months. Pain was also the main reason for visiting a dentist in Germany (49.7%; $n = 169$). The main reason for visiting a dentist in Ukraine was treatment / follow-up treatment (47.4%; $n = 253$), followed by pain / trouble with mouth (22.1%; $n = 118$). Routine check-ups were the less frequent reason for visiting a dentist in Germany (9.1%; $n = 31$). In Ukraine 20.6%

of participants ($n = 110$) visited a dentist for a check-up routine.

When participants were asked to rate different problems, caused by the state of their teeth, the main reported problems were: "Have avoided smiling because of teeth" (23.6%), "Felt embarrassed due to appearance of teeth" (22.2%), "Felt tense because of problems with teeth/ mouth" (22.2%), as depicted in Fig. 1.

Limiting factors

Figure 2 demonstrates how much different factors in opinion of participants limit their access to a dentist in Germany.

Financial barriers were the most reported limiting factor to access dental care, stated by 82.6% ($n = 540$) of the participants (at least somewhat agree). Language barriers were reported by 82.2% ($n = 536$) of the participants. 74.1% ($n = 484$) at least somewhat agreed, that the complicated health care system was a limiting factor, as well as problems with finding a dentist ($n = 466$; 71.4%).

Table 2 Oral Health

State of teeth (n (%))		State of gums (n (%))	
Very poor	44 (6.2)	Very poor	13 (1.9)
Poor	118 (16.8)	Poor	50 (7.2)
Average	282 (40.1)	Average	241 (34.7)
Good	178 (25.3)	Good	247 (35.6)
Very good	65 (9.2)	Very good	88 (12.7)
Excellent	17 (2.4)	Excellent	55 (7.9)
Frequency of cleaning teeth (n (%))		Using toothbrush (n (%))	
Twice or more a day	318 (44.4)	Yes	705 (98.3)
Once a day	357 (49.9)	No	12 (1.7)
2–6 times a week	31 (4.3)		
Once a week or more rarely	10 (1.4)		
Consuming sweets or candies (n (%))		Smoking cigarettes (n (%))	
At least every day	132 (19.2)	Every day	104 (15.2)
Several times a week	252 (36.8)	Several times a week	15 (2.2)
Once a week	93 (13.6)	Once a week	2 (0.3)
Several times a month	139 (20.3)	Several times a month or more rarely	51 (7.5)
Seldom/never	69 (10.1)	Never	511 (74.8)
Reason for last dental visit in Germany (n (%))		Frequency of visiting dentist in Ukraine (n (%))	
Pain or trouble with teeth, gums or mouth	169 (49.7)	Twice a year or more	304 (44.4)
Treatment / Follow up treatment	107 (31.5)	Once a year	217 (31.7)
Consultation / advise	33 (9.7)	Less than once a year	141 (20.6)
Routine check-up	31 (9.1)	I do not know	19 (2.8)
		Never received dental care	3 (0.5)
Reason for last dental visit in Ukraine (n (%))		Pain during last 12 month, caused by teeth or mouth? (n (%))	
Pain or trouble with teeth, gums or mouth	118 (22.1)	Yes	558 (78.7)
Treatment / Follow up treatment	253 (47.4)	No	147 (20.7)
Consultation / advise	53 (9.9)	I do not know	4 (0.6)
Routine check-up	110 (20.6)		
Failed a consultation (n (%))		Reasons for failed consultation (n (%))*	
Yes	390 (59.6)	Language barriers	260 (66.5)
No	264 (40.4)	Financial barriers	246 (62.9)
Started treatment in Ukraine (n; %)		Problems with finding a dentist	219 (56)
Yes	252 (41.7)	Complicated health care system	162 (41.4)
No	353 (58.3)	Dental anxiety	76 (19.4)
Continued treatment in Germany (n; %)		Trust issues	68 (17.4)
Yes	79 (27.3)	Social barriers	42 (10.7)
No	146 (50.3)	Transport barriers	41 (10.5)
Did not search for a dentist	65 (22.4)	Availability in region	31 (7.9)
		Cultural and religious beliefs	0 (0)
		Other	27 (6.9)
Variable	Groups	Value	p
State of teeth (mean (SD))	With higher education	3.4 (1.0)	< .0001
	Other	2.8 (1.2)	
State of gums (mean (SD))	With higher education	3.8 (1.1)	.0010
	Other	3.5 (1.1)	
Last time visited dentist for check-up (n (%))	With higher education	120 (24.1)	.0002
	Other	21 (11.2)	

* - Multiple choice was available

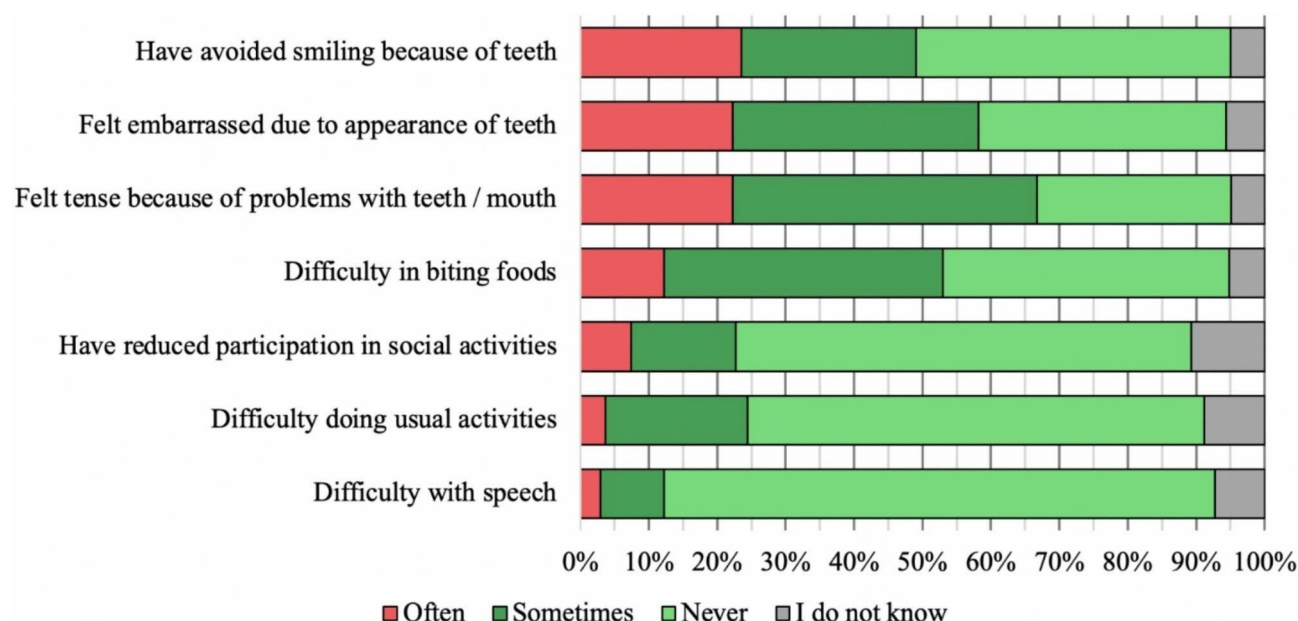


Fig. 1 Reported problems because of the status of the teeth

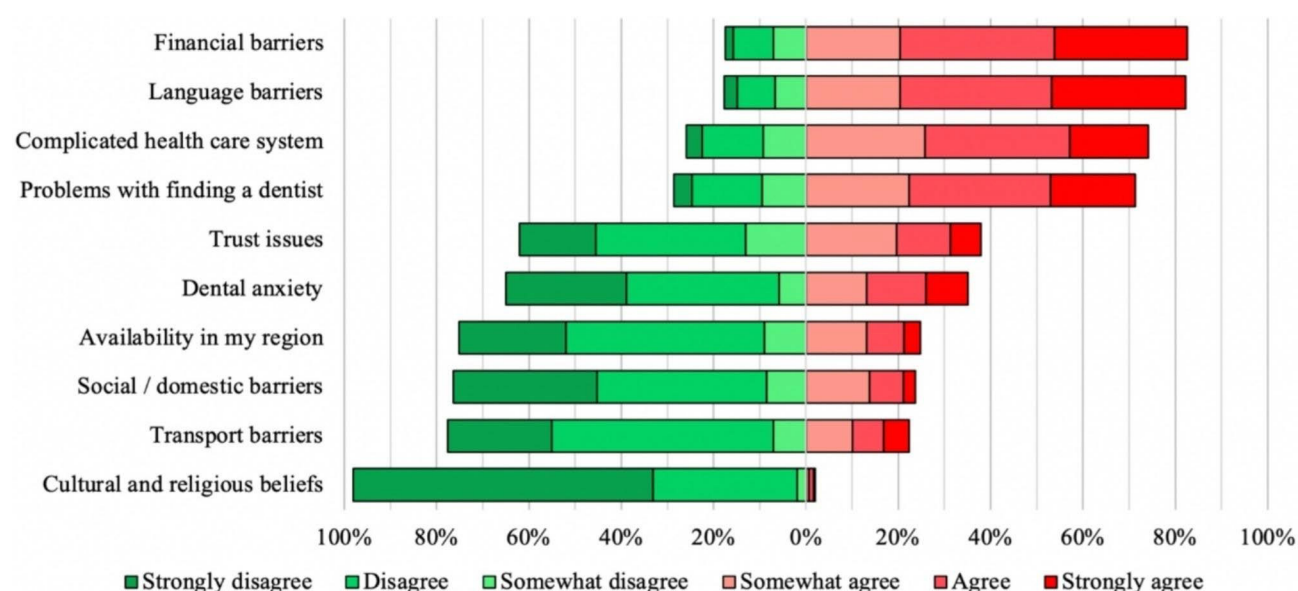


Fig. 2 Limiting factors accessing dental health care

There was no statistically significant difference in limiting factors between males and females, except for trust issues (see Table 3). Females were more likely to report trust issues (39.6%) compared to males (21.9%). Age was a significant predictor for language barriers, trust issues, dental anxiety and social/domestic barriers. Participants, who reported language barriers were older (mean age 37.8 years (SD 10.6)) compared to those without reporting language barriers (mean age 35.3 years (SD 10.5)). Younger participants (mean age 35.1 years (SD 9.0)) reported trust issues more often than older participants

(mean age 38.8 years (SD 11.4)). Trust issues were significantly associated with the size of city in Germany.

3.4. Unmet dental needs

When asked if there was a time in Germany when they needed to consult a dentist but did not, 59.6% ($n = 390$) answered with "yes" (see Table 2). They were subsequently asked for the reasons of the failed consultation. There was a statistically significant difference between people, who came with family to Germany, with regard to the frequency of failed consultations compared to participants who did not come together with

Table 3 Limiting factors and failed consultations

	Limiting factors							Failed a consultation
	Financial barriers	Language barriers	Complicated health care system	Problems with finding a dentist	Trust issues	Dental anxiety	Social / domestic barriers	
Gender (n (%))								
Males	52 (80)	53 (81.5)	53 (81.5)	47 (72.3)	14 (21.9)*	19 (29.2)	11 (17.2)	34 (53.1)
Females	482 (82.7)	478 (82.3)	428 (73.5)	414 (71.1)	230 (39.6)*	207 (35.6)	139 (24.1)	352 (60.3)
Age (mean (SD))								
Experienced this barrier	37.6 (10.7)	37.8 (10.6)*	37.3 (10.4)	37.3 (10.7)	35.1 (9.0)**	36.2 (10.6)*	33.9 (8.3)**	37.02 (9.64)
Did not experience this barrier	36.9 (10.6)	35.3 (10.5)*	37.8 (11.4)	37.7 (10.7)	38.8 (11.4)**	38.1 (10.7)*	38.4 (11.0)**	37.90 (11.78)
Size of the city in Germany (n (%))								
Large or medium	450 (81.8)	445 (81.2)	411 (74.9)	399 (72.4)	218 (39.8)*	185 (33.6%)	128 (23.5)	
Small or village	89 (86.4)	90 (87.4)	73 (70.9)	66 (65.4)	28 (27.5)*	43 (42.6%)	25 (24.5)	
Arrived alone or with family (n (%))								
Alone	101 (88.6)	89 (78.8)	79 (69.9)	86 (75.4)	39 (34.8)	38 (33.3)	14 (12.6)*	55 (48.3)*
With family	439 (81.3)	447 (82.9)	405 (75.0)	380 (70.5)	208 (38.6)	191 (35.4)	139 (25.9)*	335 (62.0)*

** - $p \leq .0001$; * - $p < .05$ **Table 4** Mean PHQ-9 and GAD-7 scores for males and females

	PHQ-9 (mean score (SD))	GAD-7 (mean score (SD))
Males	6.48 (4.45) ***	5.59 (3.99) ***
Females	10.24 (6.05) ***	8.83 (5.27) ***

*** - $p \leq .0001$ **Table 5** Relation between stress or anxiety and oral health

	PHQ-9 ≥ 10	GAD-7 ≥ 10
Pain, caused by teeth or mouth (n (%))	243 (84.1)*	205 (86.9)**
State of teeth is poor / very poor (n (%))	78 (27.4)*	65 (28.0)*
State of gums is poor / very poor (n (%))	39 (13.8)**	33 (14.4)**
Feeling embarrassed due to appearance of teeth (n (%))	185 (66.8)*	152 (68.5)*
Reduced participation in social activities (n (%))	82 (31.4)*	72 (34.3)**
Failed consultations (n (%))	189 (64.7)*	167 (70.5)***

*** - $p \leq .0001$; ** - $p < .001$; * - $p < .05$

their family (see Table 3). Participants with family were more likely to not visit a dentist ($n = 335$; 62.0%) when they needed one compared to participants who came to Germany alone ($n = 55$; 48.3%). There was no difference concerning other demographic characteristics (gender, age, education) (see **Additional File 2**). Interestingly, participants, who reported an unsuccessful consultation were more likely to report a poor or a very poor state of teeth ($n = 111$; 74.5%) and gums ($n = 44$; 75.9%), compared to other participants ($n = 271$; 54.9% and $n = 337$; 58.1% respectively).

41.7% ($n = 252$) of the participants have started a dental treatment in Ukraine (Table 2) that needed to be continued in Germany. However, only 27.3% ($n = 79$) continued the treatment, while 22.4% ($n = 65$) did not search for a

dentist and 50.3% ($n = 146$) were not able to continue the treatment in Germany.

Stress and anxiety

The mean PHQ-9 score to screen for depression was 9.9 (SD 6.01) and the mean GAD-7 score to detect anxiety was 8.5 (SD 5.26). 45.8% of the participants ($n = 292$) scored 10 or more in PHQ-9 and 37.4% ($n = 237$) scored 10 or more in GAD-7 indicating at least moderate symptoms. There was a significant association between gender and PHQ-9 with females reporting higher mean scores compared to males (see Table 4). Also, for GAD-7 females reported higher mean scores with 8.83 (SD 5.27) compared to males with a mean score of 5.59 (SD 3.99).

There was a statistically significant relation between stress or anxiety and oral health (see Table 5). Participants

with PHQ-9 score ≥ 10 were more likely to report pain, caused by teeth or mouth (84.1%; $n = 243$) than participants with a PHQ-9 score < 10 (76.3%; $n = 260$). The same relation was observed for GAD-7 (86.9%; $n = 205$ and 75.5%; $n = 295$ respectively). Participants with a PHQ-9 score ≥ 10 reported more often a poor or a very poor state of teeth (27.4%; $n = 78$) and gums (13.8%; $n = 39$) compared to participants with a PHQ-9 score < 10 (19.4%; $n = 66$ and 5.3%; $n = 18$ respectively). Participants reporting a GAD-7 score ≥ 10 rated more often that their state of teeth (28.0%; $n = 65$) and gums (14.4%; $n = 33$) was poor / very poor compared to participants with a GAD-7 score < 10 (20.0%; $n = 78$ and 5.9%; $n = 23$ respectively). Overall, high PHQ-9 and GAD-7 scores were associated with a reported feeling of being embarrassed due to the appearance of teeth and a reduced participation in social activities. Interestingly, participants with PHQ-9 score ≥ 10 (64.7%; $n = 189$) or GAD-7 ≥ 10 (70.5%; $n = 167$) were less likely to consult a dentist, when needed, and reported failed consultations more frequent compared to participants who scored less than 10 in the PHQ-9 (54.9%; $n = 189$) and GAD-7 (52.8%; $n = 209$) scales.

Discussion

In this study a high prevalence of limitations accessing dental health care and unmet needs in line with high stress and anxiety levels was observed. To the best of our knowledge, this is the first study, that covers these topics in the population of Ukrainian refugees in Germany.

Considering the sociodemographic data in this study, the population of Ukrainian refugees showed important differences compared to previous studies on refugees. Participants were predominantly middle-aged women with a high level of education. This differs from previous studies, where most of the participants were younger males with a lower level of education [10, 16, 19, 33, 34]. Therefore, specific dental care needs differ from previous studies. A low level of German as well as an average level of English could play a significant role in terms of barriers accessing dentist, which will be further discussed.

Previous studies suggest, that oral health literacy is associated with oral health [35, 36]. The reported good state of teeth and gums, and the reported good oral hygiene practices as well as the frequent visit of a dentist in Ukraine allows the assumption that the level of oral health literacy was high among the participants. However, high uncertainty regarding the presence of fluoride in toothpaste and infrequent check-ups left room for improvement. Life circumstances, such as a current war in the home country and adapting to a new country maybe an explanation among this particular group of refugees [37]. According to a recent study among the population in Germany [38] and the German Oral Health Study 5 (Deutsche Mundgesundheitsstudie V) [39], at least 60%

of participants visited a dentist for regular check-ups, which is considerably higher than the reported 21% of check-ups in refugee's home country and demonstrates a need to further improve preventive dentistry literacy among refugees, also in their home countries. In line with this study, a high level of concerns regarding aesthetic and appearance of teeth was observed.

Participants reported a high level of barriers accessing dental care, such as finances, language and a complicated health care system. Although, most participants already had active health insurance in Germany, only basic dental treatment is covered by the health insurance. However, barriers in dental care needs of refugees exceed financial strains and additional factors need to be considered, as well. Providing clearer information about the dental health system and costs in the refugees' native language could help to overcome this fear and increase the uptake. Participants, who reported unsuccessful consultations were more likely to report a poor or a very poor state of teeth and gums. Various factors, that are associated with missed or cancelled dental appointments, such as self-paying for dental care [40], high caries experience, negative beliefs of dentists and others [41]. These factors were reflected in barriers and limitations, experienced by Ukrainian refugees. Therefore, missing dental consultations would likely have a negative impact on dental health. Conversely, a bad state of teeth and gums could also lead to dental anxiety and unattendance [42]. This underscores the importance of encouraging dental services and making it accessible among this population.

With regard to mental health, the mean PHQ-9 and GAD-7 scores of participants were significantly higher among the study population compared to the German population, indicating a high mental burden [43]. According to a recent study in Germany, only 31.1% exceeded the cutoff score for depressive symptoms compared to 45.8% of the Ukrainian participants, and 21.2% exceeded the cutoff score for anxiety compared to 37.4% in this study population [44]. As expected, stress and anxiety levels were higher among the Ukrainian refugees and especially among females. This high mental burden may explain the frequent failed dental consultations. Moreover, there was a statistically significant relation between stress or anxiety and oral health. Participants who exceeded the cut-off scores for GAD-7 and PHQ-7 reported more frequent pain, felt embarrassed or rated their state of teeth and gums as bad. These findings indicate a link between mental health and oral health, and are presenting the influence of mental health on self-perception. Therefore, it is important for dentists to understand the unique needs of Ukrainian refugees, identify specific problems and possible solutions. Dentists should improve their knowledge on post-traumatic syndromes,

behavioral sciences or psychology in general and in particular regarding war-affected people.

Finally, it is important to mention the limitations of this study. Due to limited resources, the oral health of the participants was assessed with a self-assessment questionnaire and not by clinical examination. A low accuracy of self-reported questionnaires might be considered [45], although other authors stated that self-reported oral health is associated with normative indices of oral health [46]. Further, non-probability sampling methods were used. This could have led to a selection bias and reducing the likelihood of a representative sample of Ukrainian refugees in Germany. It is possible, that refugees, who encountered more limitations while accessing dental health care were more interested in participating in this study. Finally, the cross-sectional design of this study is not allowing to establish causalities. Despite these limitations, our study represents the first known examination of oral health among Ukrainian refugees in Germany, and thus provides an important contribution to the literature. There are still significant knowledge gaps about specific needs of Ukrainian refugees. The ongoing war in Ukraine resulted in a relatively new displaced population with different cultural and medical needs, compared to previous displaced people. Further research is required in order to assess these needs and improve access to optimal dental services.

Conclusions

The present study shows a high prevalence of barriers and limitations accessing dental health care among Ukrainian refugees in Germany. Together with high stress and anxiety levels these barriers and limitations could lead to unmet dental needs and subsequent worsening of oral health. Despite of some well-known barriers, there are differences compared to other displaced populations. Therefore, it is important to improve dental services for displaced people, consider their unique needs, provide financial and informational guidance, and prepare healthworkers to face novel challenges in dental care services.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12903-023-03513-x>.

Supplementary Material 1

Supplementary Material 2

Acknowledgements

We would like to thank all participants for their contribution. We would also like to thank Marcelle Dougan for the helpful comments that further improved our manuscript.

Author contributions

PM designed the study, developed, translated and distributed the questionnaire, analyzed the data, wrote the manuscript. KA designed the study, reviewed the questionnaire and the manuscript.

Funding

Open Access funding enabled and organized by Projekt DEAL.

Data Availability

The dataset(s) supporting the conclusions of this article can be made available upon request from the corresponding author.

Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

Ethical approval for the study was obtained from the local Ethics Committee of the RWTH Aachen University (EK22-292, 15 September 2022). Informed consent was obtained from all subjects and/or their legal guardian(s).

Consent for publication

Not applicable.

Footnotes

Not applicable.

Received: 4 July 2023 / Accepted: 9 October 2023

Published online: 27 October 2023

References

1. The United Nations Refugee Agency [Internet]. Refugee Data Finder [updated 2023 June 14. Available from: <https://www.unhcr.org/refugee-statistics/>.
2. One year after the start of the Russian war of aggression against Ukraine. A historic turning point for internal security too [press release]: Federal Ministry of the Interior and Community of Germany; [updated 02 March 2023. Available from: https://www.bmi.bund.de/SharedDocs/schwerpunkte/EN/ukrain/pm_ukr_2023.html.
3. Baiju RM, Peter E, Varghese NO, Sivaram R. Oral health and quality of life: current concepts. *J Clin Diagn Res*. 2017;11(6):ZE21–ZE6.
4. Grau AJ, Buggle F, Ziegler C, Schwarz W, Meuser J, Tasman AJ, et al. Association between acute cerebrovascular ischemia and chronic and recurrent infection. *Stroke*. 1997;28(9):1724–9.
5. Asher S, Stephen R, Mäntylä P, Suominen AL, Solomon A. Periodontal health, cognitive decline, and Dementia: a systematic review and meta-analysis of longitudinal studies. *J Am Geriatr Soc*. 2022;70(9):2695–709.
6. Kotronia E, Brown H, Papacosta AO, Lennon LT, Weyant RJ, Whincup PH, et al. Oral health and all-cause, Cardiovascular Disease, and respiratory mortality in older people in the UK and USA. *Sci Rep*. 2021;11(1):16452.
7. Pathak JL, Yan Y, Zhang Q, Wang L, Ge L. The role of oral microbiome in respiratory health and Diseases. *Respir Med*. 2021;185:106475.
8. Salim NA, ElSa'adeh BB, Maayta WA, Hassona YM. Dental services provided to Syrian refugee children in Jordan: a retrospective study. *Spec Care Dentist*. 2020;40(3):260–6.
9. Cote S, Geltman P, Nunn M, Lituri K, Henshaw M, Garcia RI. Dental caries of refugee children compared with US children. *Pediatrics*. 2004;114(6):e733–40.
10. Freiberg A, Wienke A, Bauer L, Niedermaier A, Führer A. Dental Care for Asylum-Seekers in Germany: a Retrospective Hospital-based study. *Int J Environ Res Public Health*. 2020;17(8).
11. Keboa MT, Hiles N, Macdonald ME. The oral health of refugees and asylumseekers: a scoping review. *Global Health*. 2016;12(1):59.
12. Kidane YS, Ziegler S, Keck V, Benson-Martin J, Jahn A, Gebresilassie T et al. Eritrean Refugees' and Asylum-Seekers' Attitude towards and Access to Oral Health care in Heidelberg, Germany: A Qualitative Study. *Int J Environ Res Public Health*. 2021;18(21).

13. Kohlenberger J, Buber-Ennsler I, Rengs B, Leitner S, Landesmann M. Barriers to health care access and service utilization of refugees in Austria: evidence from a cross-sectional survey. *Health Policy*. 2019;123(9):833–9.
14. Nurelhuda NM, Keboa MT, Lawrence HP, Nicolau B, Macdonald ME. Advancing our understanding of Dental Care pathways of refugees and Asylum Seekers in Canada: a qualitative study. *Int J Environ Res Public Health*. 2021;18(16).
15. Paisi M, Baines R, Burns L, Plessas A, Radford P, Shawe J, et al. Barriers and facilitators to dental care access among asylum seekers and refugees in highly developed countries: a systematic review. *BMC Oral Health*. 2020;20(1):337.
16. Saadeh R, Cappelli D, Bober-Moken I, Cothron A, de la Torre M. Assessing oral Health Status, practices, and Access to Care among War-affected refugees living in San Antonio, Texas. *Eur J Dent*. 2020;14(3):371–9.
17. Al-Ani A, Takriti M, Schmoeckel J, Alkilzy M, Splieth CH. National oral health survey on refugees in Germany 2016/2017: caries and subsequent Complications. *Clin Oral Investig*. 2021;25(4):2399–405.
18. Mariño R, Wright FA, Minas IH. Oral health among Vietnamese using a community health centre in Richmond, Victoria. *Aust Dent J*. 2001;46(3):208–15.
19. Solyman M, Schmidt-Westhausen AM. Oral health status among newly arrived refugees in Germany: a cross-sectional study. *BMC Oral Health*. 2018;18(1):132.
20. Ukraine-Aufenthalts-Übergangsverordnung (BAnz AT 08.03.2022 V1), (2022 Mar 7).
21. Asylbewerberleistungsgesetz, (BGBl. I S. 2022), (1997 Aug 5).
22. Leiner DJ. SoSci Survey (Version 3.4.11) [Computer software] 2019 [Available from: <https://www.sosicisurvey.de>].
23. Boynton PM, Greenhalgh T. Selecting, designing, and developing your questionnaire. *BMJ*. 2004;328(7451):1312–5.
24. WHO. Oral health surveys: Basic methods. 5th ed 2013. 125 p.
25. Dilip C, Health Status T, Requirements. Knowledge and attitude towards oral health of police recruits in Karnataka. *J Indian Association Public Health Dentistry*. 2005;5(5):20–35.
26. Kroenke K, Spitzer RL, Williams JB, Löwe B. The Patient Health Questionnaire somatic, anxiety, and depressive Symptom scales: a systematic review. *Gen Hosp Psychiatry*. 2010;32(4):345–59.
27. Negeri ZF, Levis B, Sun Y, He C, Krishnan A, Wu Y, et al. Accuracy of the Patient Health Questionnaire-9 for screening to detect major depression: updated systematic review and individual participant data meta-analysis. *BMJ*. 2021;375:n2183.
28. Moriarty AS, Gilbody S, McMillan D, Manea L. Screening and case finding for major depressive disorder using the Patient Health Questionnaire (PHQ-9): a meta-analysis. *Gen Hosp Psychiatry*. 2015;37(6):567–76.
29. Plummer F, Manea L, Trepel D, McMillan D. Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic meta-analysis. *Gen Hosp Psychiatry*. 2016;39:24–31.
30. Costantini L, Pasquarella C, Odone A, Colucci ME, Costanza A, Serafini G, et al. Screening for depression in primary care with Patient Health Questionnaire-9 (PHQ-9): a systematic review. *J Affect Disord*. 2021;279:473–83.
31. Del Greco L, Walop W, Eastridge L. Questionnaire development: 3. Translation Cmaj. 1987;136(8):817–8.
32. Pfizer. Patient Health Questionnaire (PHQ) Screeners [Internet]. [cited 2022 Aug 20]. Available from: <https://www.phqscreeners.com>.
33. Aljadeeah S, Wirtz VJ, Nagel E. Barriers to accessing Medicines among Syrian Asylum seekers and refugees in a German Federal State. *Int J Environ Res Public Health*. 2021;18(2).
34. Biddle L, Menold N, Bentner M, Nöst S, Jahn R, Ziegler S, et al. Health monitoring among asylum seekers and refugees: a state-wide, cross-sectional, population-based study in Germany. *Emerg Themes Epidemiol*. 2019;16:3.
35. Baskaradoss JK. Relationship between oral health literacy and oral health status. *BMC Oral Health*. 2018;18(1):172.
36. Kanupuru KK, Fareed N, Sudhir KM. Relationship between Oral Health Literacy and oral Health Status among College Students. *Oral Health Prev Dent*. 2015;13(4):323–30.
37. Høyvik AC, Lie B, Grijbovski AM, Willumsen T. Oral Health challenges in refugees from the Middle East and Africa: a comparative study. *J Immigr Minor Health*. 2019;21(3):443–50.
38. Mueller M, Schorle S, Vach K, Hartmann A, Zeeck A, Schlueter N. Relationship between dental experiences, oral hygiene education and self-reported oral hygiene behaviour. *PLoS ONE*. 2022;17(2):e0264306.
39. Cholmakow-Bodechtel C, Füßl-Grünig E, Geyer S, Hertrampf K, Holtfreter THB, Jordan AR et al. Fünfte Deutsche Mundgesundheitsstudie. Köln (Deutschland): Institut der Deutschen Zahnärzte (IDZ); 2016.
40. Mathu-Muju KR, Li HF, Hicks J, Nash DA, Kaplan A, Bush HM. Identifying demographic variables related to failed dental appointments in a university hospital-based residency program. *Pediatr Dent*. 2014;36(4):296–301.
41. Skaret E, Raadal M, Kvale G, Berg E. Factors related to missed and cancelled dental appointments among adolescents in Norway. *Eur J Oral Sci*. 2000;108(3):175–83.
42. Doerr PA, Lang WP, Nyquist LV, Ronis DL. Factors associated with dental anxiety. *J Am Dent Assoc*. 1998;129(8):1111–9.
43. Hinz A, Klein AM, Brähler E, Glaesmer H, Luck T, Riedel-Heller SG, et al. Psychometric evaluation of the generalized anxiety disorder screener GAD-7, based on a large German general population sample. *J Affect Disord*. 2017;210:338–44.
44. Benke C, Autenrieth LK, Asselmann E, Pané-Farré CA. Lockdown, quarantine measures, and social distancing: associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. *Psychiatry Res*. 2020;293:113462.
45. Agustanti A, Ramadhani A, Adiatman M, Rahardjo A, El Tantawi M, Maharani DA. Validation of self-reported oral health among Indonesian adolescents. *BMC Oral Health*. 2021;21(1):586.
46. Santos SA, Ortiz FR, Agostini BA, Ardenghi TM. Self-reported oral health and normative indices of dental caries among adolescents: a cohort study. *Braz Oral Res*. 2022;36:e021.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Supplementary Table 1: Barriers to access dental health care

[illegible]

Supplementary Material 2. Questionnaire



General information about the study

Aim of the study: In this study you are going to anonymously answer questions about the dental care in Germany. The aim of the study is to research the accessibility of dental care for Ukrainian refugees, which barriers and difficulties result.

Participation requirements: You are at least 14 years old Ukrainian citizen and fled to Germany since February 2022

Duration: This questionnaire will take approximately 10 minutes to complete.

Anonymity: All information you provide here will be saved and processed anonymously. This means that no information can be traced back to you personally.

Contact: If you have any questions about this study, you will find the contact details of the study directors at the end of survey.

Your participation in this study is voluntary. There are no disadvantages for you if you do not participate or discontinue your participation at any time during this study!

By completing this questionnaire, you confirm that you have read and understood the information given above and that you consent to the anonymous processing of your data.

1. Are you Ukrainian citizen?
 - ☐ Yes
 - ☐ No
 - ☐ I don't know
2. Did you flee to Germany since February 2022?
 - ☐ Yes
 - ☐ No
 - ☐ I don't know

Demographic information

3. Sex:
 - ☐ Male
 - ☐ Female
 - ☐ Divers
4. How old are you? _____
5. Marriage status:
 - ☐ Single
 - ☐ Married
 - ☐ In a relationship
 - ☐ Divorced
 - ☐ Widowed
6. What is the highest level of education you have completed?
 - ☐ Currently pupil at school
 - ☐ General secondary education
 - ☐ Vocational and technical education
 - ☐ Higher Education
 - ☐ Other
7. Language level:

	Very good	Good	Average	Poor	Very poor
a) English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) German	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Where did you live permanently in Ukraine?



- ☐ A - Western Ukraine
- ☐ B - Central Ukraine
- ☐ C - Eastern Ukraine
- ☐ D - Southern Ukraine

9. Which of these best describes place where you lived in Ukraine?

- ☐ Large city (population equal or more than 500 000)
- ☐ Medium sized city (population 100 000 - 500 000)
- ☐ Small city (less than 100 000)
- ☐ Village or urban-type village

10. Which of these best describes place where you currently staying in Germany?

- ☐ Large city (population equal or more than 500 000)
- ☐ Medium sized city (population 100 000 - 500 000)
- ☐ Small city (less than 100 000)
- ☐ Village or urban-type village

11. How long are you already in Germany?

- ☐ < 1 month
- ☐ 1-2 months
- ☐ 3-4 months
- ☐ 4-6 months
- ☐ > 6 months

12. Do you have German health insurance?

- ☐ Yes
- ☐ No
- ☐ I don't know

13. Did you arrive in Germany alone or together with family members or with friends / acquaintances?
(Multiple answers possible)

- ☐ Alone
- ☐ With family members
- ☐ With friends / acquaintances
- ☐ With other people

Oral health status and practices

14. How many natural teeth do you have?

- ☐ No natural teeth
- ☐ 1 – 9 natural teeth
- ☐ 10 – 19 natural teeth
- ☐ 20 teeth or more

15. During the past 12 months, did your teeth or mouth cause any pain or discomfort?

- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ No answer

16. Do you have any removable dentures?

	Yes	No
A partial denture?	<input type="checkbox"/>	<input type="checkbox"/>
A full upper denture?	<input type="checkbox"/>	<input type="checkbox"/>
A full lower denture?	<input type="checkbox"/>	<input type="checkbox"/>

17. How would you describe the state of your teeth and gums? Is it "excellent", "very good", "good", "average", "poor", or "very poor"?

	Excellent	Very good	Good	Average	Poor	Very poor
a) Teeth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Gums	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. How often do you clean your teeth?

- ☐ Never
- ☐ Once a month
- ☐ 2–3 times a month
- ☐ Once a week
- ☐ 2–6 times a week
- ☐ Once a day
- ☐ Twice or more a day

19. Do you use any of the following to clean your teeth?

	Yes	No
Toothbrush	<input type="checkbox"/>	<input type="checkbox"/>
Toothpick	<input type="checkbox"/>	<input type="checkbox"/>
Thread (dental floss)	<input type="checkbox"/>	<input type="checkbox"/>
Charcoal	<input type="checkbox"/>	<input type="checkbox"/>

Chewstick/miswak	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>
Please specify _____		

20.

- a) Do you use toothpaste to clean your teeth?
- ☐ Yes
 - ☐ No
 - ☐ Don't know
- b) If you answered previous question with "Yes": Do you use a toothpaste that contains fluoride?
- ☐ Yes
 - ☐ No
 - ☐ Don't know

21. How long is it since you last saw a dentist?

- ☐ Less than 6 months ago
- ☐ 6–12 months ago
- ☐ More than 1 but less than 2 years ago
- ☐ 2 or more years ago but less than 5 years ago
- ☐ 5 or more years ago
- ☐ Never received dental care

22. What was the reason of your last visit to the dentist?

(You can choose more than one option)

- ☐ Consultation/advise
- ☐ Pain or trouble with teeth, gums or mouth
- ☐ Treatment/ follow-up treatment
- ☐ Routine check-up
- ☐ Don't know/don't remember
- ☐ Never received dental care

23. How long is it since you last saw a dentist in Germany?

- ☐ Less than 1 month ago
- ☐ 1–2 months ago
- ☐ 3–5 months ago
- ☐ 6 or more months ago
- ☐ I did not visit a dentist in Germany

24. What was the reason of your last visit to the dentist in Germany?

(You can choose more than one option)

- ☐ Consultation/advise
- ☐ Pain or trouble with teeth, gums or mouth
- ☐ Treatment/ follow-up treatment
- ☐ Routine check-up
- ☐ Don't know/don't remember
- ☐ I did not visit a dentist in Germany

25. How often did you normally go to the dentist in Ukraine?

- ☐ Once a year
- ☐ Twice a year

- ☐ Four or more times a year
- ☐ Less than once a year
- ☐ Never received dental care
- ☐ Don't know/don't remember

26. Because of the state of your teeth or mouth, how often have you experienced any of the following problems during the past 12 months?
(Read each item)

	Very often	Fairly often	Some times	Never	Don't know
Difficulty in biting foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty chewing foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty with speech/trouble pronouncing words	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dry mouth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felt embarrassed due to appearance of teeth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felt tense because of problems with teeth or mouth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have avoided smiling because of teeth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Had sleep that is often interrupted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have taken days off work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty doing usual activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felt less tolerant of spouse or people who are close to you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have reduced participation in social activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. How often do you eat or drink any of the following foods, even in small quantities?
(Read each item)

	Several times a day	Every day	Several times a week	Once a week	Several times a month	Seldom/never
Fresh fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biscuits, cakes, cream cakes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sweet pies, buns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jam or honey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chewing gum containing sugar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sweets/candy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lemonade, Coca Cola or other soft drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tea with sugar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coffee with sugar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. How often do you use any of the following types of tobacco?
(Read each item)

	Every day	Several times a week	Once a week	Several times a month	Seldom	Never
Cigarettes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cigars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A pipe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chewing tobacco	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use snuff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Please specify _____						

29. During the past 30 days, on the days you drank alcohol, how many drinks did you usually drink per day?

- ☐ Less than 1 drink
- ☐ 1 drink
- ☐ 2 drinks
- ☐ 3 drinks
- ☐ 4 drinks
- ☐ 5 or more drinks
- ☐ Did not drink alcohol during the past 30 days

Dental care access

30. Based on your experience, how much do these factors in your opinion limit your access to dentist in Germany?

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
Language barriers, such as - I don't understand the language - I cannot explain what my problem is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Financial barriers, such as - I am afraid that I need to pay too much - I could not financially afford to	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transport barriers - It was not possible for me to physically reach the facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Availability in my region	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Complicated health care system - I don't understand how the (dental) health care system works in Germany	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Problems with finding a dentist - I don't know how to find and register with a dentist - I don't know a good dentist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dental anxiety - I am afraid of the treatment or the dentist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trust issues - I don't trust the dentists here in Germany	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cultural and religious beliefs - I don't go to the dentist because of my culture or religion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social/domestic barriers - Treatment/consultation is not possible for me because of my schedule - Someone needs to stay with my children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Unmet needs for dental health services

31.

- a) Was there any time in Germany when you needed to consult a dentist but did not?
- ☐ Yes
- ☐ No
- ☐ No need for examination or treatment
- b) If you answered previous question with "Yes": What was the reason?

	Yes	No
Language barriers - I don't understand the language - I cannot explain what my problem is	<input type="checkbox"/>	<input type="checkbox"/>
Financial barriers - I am afraid that I need to pay too much - I could not financially afford to	<input type="checkbox"/>	<input type="checkbox"/>
Transport barriers - It was not possible for me to physically reach the facility	<input type="checkbox"/>	<input type="checkbox"/>
Availability in my region	<input type="checkbox"/>	<input type="checkbox"/>
Complicated health care system - I don't understand how the (dental) health care system works in Germany	<input type="checkbox"/>	<input type="checkbox"/>
Problems with finding a dentist - I don't know how to find and register with a dentist - I don't know a good dentist	<input type="checkbox"/>	<input type="checkbox"/>

Dental anxiety - I am afraid of the treatment or the dentist	<input type="checkbox"/>	<input type="checkbox"/>
Trust issues - I don't trust the dentists here in Germany	<input type="checkbox"/>	<input type="checkbox"/>
Cultural and religious beliefs - I don't go to the dentist because of my culture or religion	<input type="checkbox"/>	<input type="checkbox"/>
Social/domestic barriers - Treatment/consultation is not possible for me because of my schedule - Someone needs to stay with my children	<input type="checkbox"/>	<input type="checkbox"/>
Other Please specify _____	<input type="checkbox"/>	<input type="checkbox"/>

32.

- a) Did you start a dental treatment in Ukraine, that needs to be continued in Germany?
(for example, orthodontic treatment)
- ☐ Yes
☐ No
☐ I don't know
- b) If you answered previous question with "Yes": Could you find a dentist and continue this treatment in Germany?
- ☐ Yes
☐ No
☐ I did not search a dentist

33. How do you rate the quality of dental care in Germany in general?

- ☐ Very good
☐ Good
☐ Average
☐ Poor
☐ Very poor
☐ Don't know

Stress measurement

In this final part of the survey, you'll answer a few questions about your feelings and emotions.

34. Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Feeling down, depressed, or hopeless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Trouble falling or staying asleep, or sleeping too much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Feeling tired or having little energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Poor appetite or overeating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Trouble concentrating on things, such as reading the newspaper or watching television	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Thoughts that you would be better off dead or of hurting yourself in some way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?				
Not difficult at all <input type="checkbox"/>	Somewhat difficult <input type="checkbox"/>	Very difficult <input type="checkbox"/>	Extremely difficult <input type="checkbox"/>	

Anxiety measurement

35. Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Not being able to stop or control worrying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Worrying too much about different things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Trouble relaxing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Being so restless that it is hard to sit still	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Becoming easily annoyed or irritable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Feeling afraid as if something awful might happen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you for participating in this study!

Please send the questionnaire within two weeks back to:

E-Mail: maksym.ponomarenko@rwth-aachen.de

Postal address:

PD Dr. med. Andrea Kaifie-Pechmann and Maksym Ponomarenko

Institut für Arbeits-, Sozial- und Umweltmedizin

Uniklinikum RWTH Aachen

Pauwelsstraße 30 52074 Aachen

Deutschland

If you want to participate in a prize draw leave your e-mail address below:

E-mail: _____

Danksagung

Ich möchte mich herzlich bei meiner Doktormutter Frau Prof. Dr. med. Andrea Kaifie-Pechmann für die Zusammenentwicklung des Dissertationsthemas und für die kontinuierliche Hilfe während der Arbeit bedanken.

Bei der Erstellung des Manuskripts hat mich Herr Marcelle Dougan unterstützt, der mir wichtige Anregungen bei sprachlichen Korrekturen gegeben hat.

Ich danke meiner Familie, die an mich während der Promotion geglaubt und mich die ganze Zeit unterstützt haben.

Erklärung § 5 Abs. 1 zur Datenaufbewahrung

Hiermit erkläre ich, dass die dieser Dissertation zu Grunde liegenden Originaldaten in dem Institut für Arbeits-, Sozial- und Umweltmedizin des Universitätsklinikums Aachen hinterlegt sind.

Erklärung gemäß § 5 Abs. (1) und (2), und § 11 Abs. (3) 12. der Promotionsordnung

Hiermit erkläre ich, Maksym Ponomarenko, an Eides statt, dass ich den wesentlichen Anteil an der Publikation:

Ponomarenko, M., Kaifie, A.: Oral health, stress and barriers accessing dental health care among war-affected Ukrainian refugees in Germany; BMC Oral Health; 2023, 23, 804 geleistet habe.

Die Anteile an der Arbeit waren wie folgt:

	Maksym Ponomarenko	Andrea Kaifie-Pechmann	Summe (%)
Studiendesign/Konzeption	70	30	100
Erstellung des Umfragebogens	100	0	100
Korrektur des Fragebogens	50	50	100
Datengewinnung	100	0	
Datenauswertung	100	0	100
Interpretation der Datenauswertung	80	20	100
Verfassung des Manuskripts	100	0	100
Korrektur des Manuskripts	50	50	100

Unterschrift der Doktorandin/des Doktoranden

Als Doktorvater und / oder korrespondierender Autor bestätige ich die Angaben von Maksym Ponomarenko

Unterschrift des Doktorvaters

Unterschrift des korresp. Autors (falls abweichend)

Ich schließe mich der Erklärung von Andrea Kaifie-Pechmann als Koautor an

Namen und Unterschriften aller deutschsprachigen Koautoren (auf separaten Seiten, aber immer mit Tabelle, möglich)

