Uncontrolled and under-diagnosed asthma in a Damascus shelter during the Syrian crisis

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Background: Studies have shown that poor shelter or dwelling conditions may lead to deteriorations in health. Those with asthma may be more susceptible to compromised living conditions and stress leading to a higher risk of asthma exacerbations. To describe the asthma control and quality of life of individuals with diagnosed asthma living in a shelter in Damascus, Syria and estimate the prevalence of respiratory symptoms in shelter dwellers without diagnosed asthma.

Methods: In this cross-sectional study, all individuals 5 years and older living in Al-Herjalleh shelter with diagnosed asthma were recruited to complete a questionnaire, which included items related to their respiratory symptoms, asthma exacerbations, exposure to asthma triggers, medication use, and health-related quality of life before and since entering the shelter. A representative sample of shelter dwellers without diagnosed asthma also completed a questionnaire to establish their demographics, respiratory symptoms, environment and chronic disease co-morbidities, in order to identify factors associated with under-diagnosed asthma. All participants underwent spirometry to measure their lung function. Descriptive statistics were calculated, and chi-square tests and Student's *t*-tests were used to compare individuals with asthma before and since entering the shelter, as well as to compare those with under-diagnosed asthma and individuals without asthma.

Results: The prevalence of asthma at the Al-Herjalleh shelter in those aged 5 years and older was approximately 8.5%. Nearly 70% of the asthma group felt their asthma had worsened since entering the shelter, and there was a significant drop in the proportion of individuals using inhaled corticosteroids (ICS), with only 4.3% using daily ICS in the shelter (P<0.0001). The proportion of individuals experiencing a severe asthma attack did not change after entering the shelter (P=0.97), but almost all individuals with asthma (94.4%) reported worsening in their health-related quality of life. In the non-asthma group, 44.2% of participants reported episodes of wheezing, coughing and breathlessness at night, consistent with under-diagnosed asthma. A higher proportion of those with under-diagnosed asthma had allergic rhinitis (57.1%), symptoms of post-traumatic stress disorder (PTSD) (35.1%), and abnormal spirometry (60.0%), compared to those without asthma.

Conclusions: The findings of our study highlight the need for asthma programs in Syrian shelters as significant gaps exist in both the screening and management of chronic respiratory diseases to minimize asthma deterioration in Syrian shelter dwellers.

Introduction

According to the United Nations (UN), 6.5 million people have been internally displaced within Syria since the start of the civil war (1). As of 2016, 1.7 million internally displaced persons were living in camps and collective centres, including shelters (2). Studies have shown that poor shelter or dwelling conditions (such as overcrowding, lack of basic resources, and poor sanitation) may lead to deteriorations in health (3-6). For example, in the aftermath of the Great East Japan Earthquake and tsunami in 2011, the prevalence of asthma, exacerbations of chronic obstructive pulmonary disease (COPD), and community-acquired pneumonia were two to three times greater compared to the previous year, with half of the community-acquired pneumonia cases originating in evacuation shelters (6). Individuals with asthma may be more susceptible to compromised living conditions and stress leading to a higher risk of asthma exacerbations and other complications (3-6). It is important to identify uncontrolled asthmatics and those who are underdiagnosed or at-risk of developing asthma in order to target preventive strategies and asthma management to minimize the deterioration of asthma control.

The primary study objective was to describe the asthma control and quality of life of individuals with diagnosed asthma (7,8) living in a shelter in Damascus, Syria. We described the living conditions in shelters and asthma-related health outcomes. Specifically, we investigated frequency of respiratory symptoms, asthma exacerbations, exposure to new triggers associated with the ongoing war, exposure to second-hand smoke (SHS), crowding, access to medication and access to specialty care for those with severe asthma.

In addition, we had three secondary objectives: (I) to measure asthma-related symptoms among shelter dwellers who have not previously been diagnosed with asthma; (II) to estimate the prevalence of symptoms of post-traumatic stress disorder (PTSD) in the shelter dwellers; and (III) to screen for other chronic disease co-morbidities, including allergic rhinitis, hypertension, and diabetes.

Methods

Study populations

A total of 850 internally displaced persons settled in the Al-Herjalleh shelter in Damascus, Syria. Two distinct groups were recruited to participate in this cross-sectional study: (I) prevalent and incident asthma group (those with existing asthma, and those newly diagnosed after coming to the shelter, respectively); and (II) non-asthma group (those without diagnosed asthma).

For the prevalent and incident asthma group, all individuals aged 5 years and older with self-reported diagnosed asthma were recruited to participate. The primary outcomes were asthma control and quality of life. Both outcomes were assessed by administering a questionnaire, which included asthma indicators that were recommended by the Canadian Primary Care guidelines (7,8). Participants were asked to recall their symptoms and quality of life prior to entering the shelter, and report their current status as shelter dwellers. Additionally, data on asthma medication use and exposure to new asthma triggers were collected. With respect to environmental factors associated with respiratory health, information was collected on exposure to indoor air pollutants and crowding in the Al-Herjalleh shelter. Participants' lung function was measured by a trained researcher using a Spirobank portable spirometer, using American Thoracic Society (ATS)/European Respiratory Society (ERS) guidelines. To address our secondary objectives, participants were screened for symptoms of PTSD (including physical symptoms, traumatic flashbacks, and cognitive symptoms) as well as chronic disease co-morbidities (hypertension, allergic rhinitis, and diabetes).

For the non-asthma group, a representative sample of shelter dwellers aged 5 years and older were recruited to participate. A questionnaire was administered to all participants, which included items related to respiratory symptoms, smoking status, chronic disease co-morbidities, crowding, exposure to triggers of respiratory exacerbations, and symptoms of PTSD. A trained researcher measured the participants' lung function using a Spirobank spirometer.

Individuals in the non-asthma group were further subdivided into those with under-diagnosed asthma and those who did not have asthma, based on whether they reported episodes of coughing, wheezing and breathlessness at night. Questionnaires used in this study can be found on the online supplement (*Supplement I*).

Statistical analysis

Descriptive statistics were calculated for both the prevalent and incident asthma group and non-asthma group. Continuous variables were described using medians, means and standard deviations. Categorical variables were described using frequency distributions and percentages. Student's *t*-tests and chi-square tests were used to assess the statistical significance of differences between those with under-diagnosed asthma and those who did not have asthma and to identify factors associated with under-diagnosed asthma. All analyses were completed using the Statistical Package for the Social Sciences (SPSS) version 18 (IBM Corporation, Armonk, NY, USA).

Results

Prevalent and incident asthma group

Among the 850 individuals living in the Al-Herjalleh shelter, 72 were previously diagnosed with asthma, either before or since entering the shelter. The prevalence of asthma at the Al-Herjalleh shelter in those aged 5 years and older was approximately 8.5%. Descriptive statistics for the prevalent and incident asthma group are presented in *Table 1*. The age of participants ranged from 5 to 76 years, with a mean of 26.1 years (SD: 18.8). There was a slightly higher proportion of males (52.8%) and the majority of adults with asthma (91.7%) were married and living with their family. Only one third (34.7%) of those with asthma were employed. The average monthly income in the prevalent and incident asthma group was $16.63 (SD: 10.5), with 91.7% of the group earning less than $2 per day.

More than half (52.9%) of the individuals with asthma were diagnosed by a private pulmonologist, one third (34.3%) by a general doctor, and 12.9% were diagnosed in a primary care centre. Nearly 70% of the asthma group felt their asthma had worsened since entering the shelter, with 57.1% of those on a short-acting beta2-agonist (SABA) inhaler reporting increased use. There was a significant drop in the proportion of individuals using inhaled corticosteroids (ICS) since entering the shelter, with only 4.3% using daily ICS in the shelter (P<0.0001). When asked how frequently they were awoken by their asthma, 59.2% said they woke up more since coming to the shelter. Even though the shelter dwellers had uncontrolled asthma, the proportion of individuals experiencing a severe asthma attack did not change after entering the shelter (P=0.97). Almost all individuals with asthma (94.4%) reported worsening in their health-related quality of life since coming to the shelter. The mean percent predicted FEV_1 (FEV_1%) before bronchodilators for the asthma group was 87% (SD: 19%), and the FEV_1% for 30.0% of participants indicated an obstructive defect (<80%). After administering a bronchodilator, 66.7% of those with an obstructive defect demonstrated total reversibility, while the spirometry of 33.3% was indicative of a fixed airway disease, with an abnormal FEV_1% and an abnormal FEV_1/FVC ratio (<70%) after bronchodilators.

Table 2 shows changes in conditions before and after coming to the shelters. In terms of crowding, the number of persons living in the same room at the shelter was not significantly different from before entering the shelter (P=0.83). The most common new asthma trigger was odor from other shelter dwellers (36.1%), including smells associated with cooking and/or heating. Other common asthma triggers were dust, SHS, detergents, and stress. A significantly higher proportion of individuals in the asthma group reported smoking cigarettes since entering the shelter (51.4%, P<0.05).

With regard to our secondary objectives, 26.7% of participants aged 30 years and older had hypertension. Of all those in the asthma group, 16.7% reported symptoms of PTSD. Two-thirds of the individuals with symptoms of PTSD had physical manifestations, half had traumatic flashbacks, and 41.7% had cognitive symptoms.

Non-asthma group

Table 3 shows the characteristics of 204 participants with either under-diagnosed asthma or without asthma. Of these shelter dwellers, 113 did not have asthma symptoms and 91 were not previously diagnosed with asthma, but reported episodes of wheezing, coughing and breathlessness at night, which indicate under-diagnosed asthma. Those with under-diagnosed asthma did not differ significantly from those with no asthma in terms of age, gender, diabetes, hypertension, smoking status or exposure to SHS. A significantly higher proportion of those with under-

3418

Mohammad et al. Asthma in shelter in Syria

Table 1 Descriptive characteristics of participants with diagnosed asthma (n=72)

Characteristics	Number	%
Age in years		
5–12	27	37.50
13–18	9	12.50
19–45	23	31.94
>45	13	18.06
Mean ± SD	26.1±18.8	–
Gender		
Female	34	47.22
Male	38	52.78
Employment		
Employed	25	34.72
Unemployed	23	31.94
Student	24	33.33
Marital status (>18 years old)		
Married, living with family	33	91.67
Other	3	8.33
Family size		
≤6	19	55.88
>6	15	44.12
Missing	2	–
Monthly income ($), mean ± SD	16.63±10.45	–
Daily income ($)		
<2	66	91.67
≥2	6	8.33
Rurality		
Yes	49	73.13
No	18	26.87
Missing	5	–
Asthma diagnosis		
By pulmonary specialist, private	37	52.86
By general physician	24	34.29
By primary care health center	9	12.86
Missing	2	–

Table 1 (continued)

Table 1 (continued)

Characteristics	Number	%
Self-reported asthma worsening		
Yes	48	68.57
No	22	31.43
Missing	2	–
SABA inhaler use		
Yes	40	57.14
No	30	42.86
Missing	2	–
Self-reported increase in SABA inhaler use (in users)		
Yes	33	82.50
No	7	17.50
Uses SABA inhaler correctly (in users)		
Yes	20	50.00
No	20	50.00
Frequency of waking up at night due to asthma at shelter		
0 (no more)	3	4.23
1	7	9.86
2	19	26.76
3 (some more)	18	25.35
4	16	22.54
5 (a lot more)	8	11.27
Missing	1	–
Exposed to new asthma triggers in shelter		
Stress and psychiatric triggers	10	13.89
Odors (cooking, heating, perfume)	26	36.11
Second-hand smoke	11	15.28
Vapors	4	5.56
Cold and dampness	9	12.50
Dust	17	23.61
Detergents	10	14

Table 1 (continued)

Table 1 (continued)

Characteristics	Number	%
Self-reported worsening of quality of life		
0	4	5.63
1	5	7.04
2	25	35.21
3	17	23.94
4	16	22.54
5	4	5.63
Missing	1	–
Medical emergency point accessible 24 h prior to shelter		
Yes	42	59.15
No	29	40.85
Missing	1	–
Know someone who died from asthma attack at shelter		
Yes	6	9.38
No	58	90.63
Missing	8	–
Exposed to cigarette smoke in the shelter, non-smokers		
Yes	18	51.43
No	17	48.57
Asthma triggered by cigarette smoke, non-smokers		
Yes	15	83.33
No	3	16.67
FEV_1 (%) before bronchodilators (n=70), mean ± SD	87±19	–
FEV_1 (%) before bronchodilators (n=70)		
<80	21	30.00
≥80	49	70.00
FEV_1 (%) after bronchodilators (n=21), mean ± SD	87±19	–
FEV_1 (%) after bronchodilators (n=21)		
<80	7	33.33
≥80	14	66.67
FEV_1/FVC (%) after bronchodilators (n=21)		
<70	7	33.33
≥70	14	66.67

Table 1 (continued)

Table 1 (continued)

Characteristics	Number	%
Oxygen saturation (SpO_2) (%)		
<92	5	7.14
≥92	65	92.86
Missing	2	–
Systolic blood pressure (mmHg) (n=29), mean ± SD	131±20	–
Diastolic blood pressure (mmHg) (n=29), mean ± SD	83±14	–
Hypertension (>30 years old)		
Yes	8	26.67
No	22	73.33
Any symptom of PTSD		
Yes	12	16.67
No	60	83.33
PTSD symptoms (n=12)		
Physical symptoms	8	66.67
Flashbacks	6	50.00
Cognitive symptoms	5	41.67

SABA, short-acting beta2-agonist; PTSD, post-traumatic stress disorder.

diagnosed asthma had allergic rhinitis compared to those with no asthma (57.1% *vs.* 25.7%, P<0.0001). Similarly, a higher proportion of those with under-diagnosed asthma reported symptoms of PTSD (35.1% *vs.* 15.7%, P<0.05), though their PTSD symptom profile was not significantly different from those with no asthma (P=0.70).

The mean FEV_1% for the under-diagnosed asthma group (83%, SD: 23%) was lower than that of the no asthma group (89%, SD: 17%). More than 45.5% (40 persons) of those in the under-diagnosed asthma group had an FEV_1% of less than 80%, indicating an obstructive defect, compared to only 27% in the no asthma group. Four persons of 10 in the no asthma group who underwent reversibility test continued to have FEV_1 <80%, and FEV_1/FVC <70% in 5 persons (5/104=4.81%). One in 5 persons (17/85=20%) in the under-diagnosed asthma group continued to have FEV_1/FVC <70% after bronchodilators which is indicative of fixed airway disease (i.e., COPD, or asthma and COPD overlap).

3420

Mohammad et al. Asthma in shelter in Syria

Table 2 Changes in asthma control before and after coming to the shelter in participants with diagnosed asthma (n=72)

Factors	Before shelter		In shelter		P value
	n	%	n	%	
Daily ICS use					
Yes	22	30.56	3	4.29	<0.0001
No	50	69.44	67	95.71	
Missing	0	–	2	–	
Exposed to triggers					
Stress and psychiatric triggers	41	56.94	40	55.56	0.867
Vapors	44	61.11	36	50.00	0.180
Odors (cooking, heating)*	19	26.39	12	16.67	0.156
Chemicals, from weapons	16	22.22	6	8.33	<0.05
Others**	9	12.50	36	50.00	<0.0001
Severe asthma attack at home, without access to hospital					
Yes	25	35.21	23	34.85	0.965
No	46	64.79	43	65.15	
Missing	1	–	6	–	
Oral or injection corticosteroids available for severe asthma attack at home					
Yes	18	26.09	14	22.22	0.605
No	51	73.91	49	77.78	
Missing	3	–	9	–	
Used oral or injection corticosteroids for severe asthma attack at home					
Yes	13	52.00	13	56.52	0.753
No	12	48.00	10	2.46	
Cigarette smoking					
Yes	25	34.72	37	51.39	<0.05
No	47	65.28	35	48.61	
Narghile smoking					
Yes	11	15.28	13	18.06	0.655
No	61	84.72	59	81.94	
Exposed to narghile smoke, in non-smokers of narghile					
Yes	29	47.54	20	33.90	0.129
No	32	52.46	39	66.10	
Asthma triggered by narghile smoke					
Yes	24	82.76	9	45.00	
No	5	17.24	11	55.00	
Number of persons living in the same room					
1–3	10	13.89	9	12.50	0.828
4–6	42	58.33	39	54.17	
7–9	15	20.83	16	22.22	
>9	5	6.94	8	11.11	

*, heating or cooking using fuels such as plastic, trashes, cartoon, and wheels; **, odors of unburied victims in conflict zones before coming to shelter; P values in italic form indicate statistical significance if <0.05. ICS, inhaled corticosteroids.

Table 3 Characteristics of participants with under-diagnosed asthma (n=91) and those without asthma (n=113)

Characteristics	Under-diagnosed asthma (n=91)		No asthma (n=113)		P value
	n	%	n	%	
Age in years					
5-12	15	16.48	16	14.29	0.094
13-18	12	13.19	12	10.71	
19-45	33	36.26	43	38.39	
45-65	21	23.08	38	33.93	
>65	10	10.99	3	2.68	
Missing	0	–	1	–	
Gender					
Female	55	60.44	73	64.60	0.541
Male	36	39.56	40	35.40	
Any chronic disease					
Yes	40	43.96	52	46.02	0.769
No	51	56.04	61	53.98	
Diabetes					
Yes	6	6.59	14	12.39	0.166
No	85	93.41	99	87.61	
Hypertension					
Yes	14	15.38	17	15.04	0.946
No	77	84.62	96	84.96	
Chronic disease since entering shelter					
Yes	16	42.11	17	37.78	0.688
No	22	57.89	28	62.22	
Missing	2	–	7	–	
Cigarette smoker, before entering shelter					
Yes	19	20.88	34	30.09	0.136
No	72	79.12	79	69.91	
Cigarette smoker, since entering shelter					
Yes	4	5.56	5	4.42	0.841
No	68	94.44	74	93.67	
Non-smokers exposed to second-hand cigarette smoke, before entering shelter					
Yes	43	59.72	57	72.15	0.107
No	29	40.28	22	27.85	

Table 3 (*continued*)

Table 3 (*continued*)

Characteristics	Under-diagnosed asthma (n=91)		No asthma (n=113)		P value
	n	%	n	%	
Non-smokers exposed to second-hand cigarette smoke, since entering shelter					
No	23	33.82	19	25.68	0.288
Yes	45	66.18	55	74.32	
Narghile smoker, before entering shelter					
Yes	7	7.69	10	8.85	0.766
No	84	92.31	103	91.15	
Narghile smoker, since entering shelter					
Yes	4	4.76	2	1.94	0.276
No	80	95.24	101	98.06	
Exposed to second-hand narghile smoke, before entering shelter					
Yes	28	33.33	29	28.16	0.444
No	56	66.67	74	71.84	
Exposed to second-hand narghile smoke, since entering shelter					
Yes	26	32.50	31	30.1	0.728
No	54	67.50	72	69.9	
Allergic rhinitis					
Yes	52	57.14	29	25.66	*<0.0001*
No	39	42.86	84	74.34	
FEV_1 (%) before bronchodilators					
Mean ± SD	83±23	–	89±17	–	0.013
FEV_1 (%) before bronchodilators (n=195)					
<80	40	45.45	29	27.10	0.008
FEV_1 (%) after bronchodilators (n1=27, n2=10)					
Mean ± SD	76±25	–	84±21	–	0.403
FEV_1 (%) after bronchodilators					
<80	15/27	55.56	4/10	40.00	0.401
FEV_1/FVC (%) after bronchodilators					
<70	17/85	20.00	5/104	4.81	0.001
Oxygen saturation (SpO_2) (%)					
Mean ± SD	97±2	–	97±2	–	
Systolic blood pressure (mmHg) (in>30 years)					
Mean ± SD	130±32	–	130±31	–	

Table 3 (*continued*)

3422

Mohammad et al. Asthma in shelter in Syria

Table 3 *(continued)*

Characteristics	Under-diagnosed asthma (n=91)		No asthma (n=113)		P value
	n	%	n	%	
Systolic blood pressure (mmHg) (in>30 years)					
>140	16/57	28.07	19/71	26.76	
Diastolic blood pressure (mmHg)					
Mean ± SD	85±20	–	82±18	–	
Any symptom of PTSD					
Yes	20	35.09	11	15.71	*<0.05*
No	37	64.91	59	84.29	
Missing	34	–	43	–	
Symptoms of PTSD					
Physical symptoms	11	55.00	4	36.36	0.696
Flashbacks	3	15.00	3	27.27	
Cognitive symptoms	4	20.00	2	18.18	
Multiple symptoms	2	10.00	2	18.18	

P values in italic form indicate statistical significance if P<0.05.

Discussion

In our study, which included both children and adults settled in the Al-Herjalleh shelter, we estimated the prevalence of asthma to be 8.5%, which is consistent with the average of estimates from the International Study of Asthma and Allergies in Childhood (ISAAC) and the WHO-Global Alliance against Chronic Respiratory Disease (WHO-GARD). ISAAC estimated that the prevalence of asthma (defined as wheezing in the last 12 months without having a cold in children aged 13–14 years) was 5.2% in Syria (9), and according to a primary care survey implemented in collaboration with the WHO-GARD, the prevalence of asthma in Syrian individuals presenting to a primary care center for any reason was estimated to be 13% (10). The average of these two asthma prevalence estimates, 9.1%, is very close to what we observed in the Al-Herjalleh shelter.

Individuals with previously diagnosed asthma at the Al-Herjalleh shelter had poorly controlled and worsening asthma, which impacted their quality of life. Daily ICS use was low, declining from 30.1% before entering the

shelter to 4.3% in the shelter, and only half of those using an inhaler demonstrated the correct technique. The war and subsequent displacement have led those with asthma to be exposed to several new triggers, including odors, stress, SHS, and chemicals. A number of individuals with asthma have also taken up smoking cigarettes or narghile since entering the shelter. Surprisingly, the proportion of individuals experiencing severe asthma attacks did not change significantly after entering the shelter, nor did their access to emergency department. However, nearly half of them took oral corticosteroids as rescue medication. Nighttime symptoms are considered the most sensitive and specific for asthma diagnosis in validated epidemiological studies such as the ECRHS (11). In the non-asthma group, a shocking 44.2% of participants reported episodes of wheezing, coughing and breathlessness at night, consistent with under-diagnosed asthma. A high proportion of those subdivided into the under-diagnosed asthma group (35.1%) reported symptoms of PTSD, which may account for their shortness of breath or coughing at night (paroxysmal nocturnal dyspnea, wheeze and cough). It is plausible because individuals with PTSD exhibit an altered phenotype of regulatory T cells (12) and furthermore, it has been suggested that asthma onset can be linked to family/personal disasters (13) which is the case in these shelter dwellers (loss of home and/or family member).There are also other adverse factors in shelter living. For example, cooking in the same room where the family lives may increase the exposure to particulate matters ($PM_{2.5}$) which can exacerbate asthma (14). Other triggers include use of detergent such as bleach (sodium hypochlorite), which is widely used in Syria (15) and amongst the shelter dwellers, exposure to SHS (16,17) and poverty (17,18) (the study participants had an average daily income of less than 2 USD/day). Finally, our spirometry data also suggested that both asthma and COPD were severely under-diagnosed, and thus not adequately managed.

The findings of our study highlight the need for asthma programs in Syrian shelters, as significant gaps exist in both the screening and management of chronic respiratory diseases. Although a primary care centre was nearby, and those in the Al-Herjalleh shelter had access to an emergency department during the conflict, however, screening and management campaigns were not integrated into the shelters. Fortunately, since our survey was conducted, collaborators from the Non-Communicable Disease (NCD) Department at the Syrian Ministry of Health (MOH) and the WHO country office agreed to include shelters in the

national chronic respiratory disease program. Already, the MOH has distributed ICS to shelter dwellers with asthma, and provided training for primary care doctors and nurses in chronic respiratory disease. The MOH is also collaborating with Tishreen University and WHO Country office to publish national guidelines on evidence-based diagnosis and management of chronic respiratory disease. With continued funding, support and evaluation, we hope these programs will minimize asthma deterioration in Syrian shelter dwellers.

Conclusions

Amongst shelter dweller in Syria, asthma is uncontrolled and poorly managed and underdiagnosed asthma is prevalent. More than 2 of 5 of those indicated without asthma had night attacks of wheeze, cough and breathlessness consistent with asthma with the majority of them confirmed of asthma with lung function measures. Fixed airflow limitation after bronchodilators allude to underdiagnosed COPD, very severe uncontrolled asthma, or asthma-COPD overlap (19,20). As result to our survey and findings, shelters have been included in the national program of Chronic Respiratory Disease (CRD) launched in collaboration amongst the MOH, the Ministry of Higher Education and the WHO country office.

Acknowledgements

Footnote

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Supplement I Online supplement: study questionnaires

Online Supplement: Study Questionnaires

### Prevalent and Incident Asthma Group

Patient Demographics

1. Age (years):
2. Height (cm):
3. Weight (kg):
4. Sex: (M/F)
5. Number of individuals in your immediate family:
6. Occupation/Occupation of head of family:
7. Education/Education of head of family:
8. How long have you been in the shelter?
9. Previous residence: (Urban/Rural)

Asthma History
10. Were you diagnosed with asthma before entering the shelter? (Y/N) *If N, continue to 11. If Y, proceed to 12.*
11. Were you diagnosed with asthma after entering the shelter? (Y/N)
12. When were you diagnosed with asthma? (Year and age)
13. Who diagnosed your asthma? (Private Doctor/Hospital Outpatient Clinic/Primary Care Provider/Pharmacist/Family/Teacher/Colleague/Other)
14. Do you feel your asthma is getting worse (uncontrolled asthma)? (Y/N)
15. Did you use inhaled beta-2 agonists before coming to the shelter? (Y/N) *If Y, continue to 15a. If N, proceed to 16.*
    a. Do you use inhaled beta-2 agonists more than before entering the shelter? (Y/N)
    b. [Ask participants to show you how he/she uses the inhaler]. Did the participant use his/her inhaler correctly? (Y/N)
16. Have you been using inhaled beta-2 agonists since entering the shelter? (Y/N) *If Y, continue to 16a. If N, proceed to 17.*
    a. How many times per day?
    b. How many times at night?

c. How many times per week?

17. On a scale of 0 to 5, do you wake up more at night since coming to the shelter? *(Circle your answer)*

```
 |_____|_____|_____|_____|_____|
 0       1       2       3       4       5
No more         Some more       A lot more
```
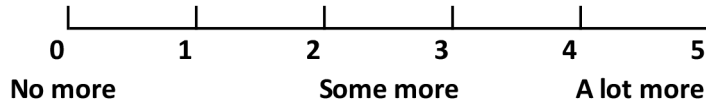
18. Did you use inhaled corticosteroids (ICS) before coming to the shelter? (Y/N) *If Y, proceed to 18a. If N, continue to 19.*
    a. Specify brand of ICS:
    b. Dose:
    c. Did you take ICS daily as prescribed? (Y/N) *If N, continue to 18d. If Y, proceed to 19.*
    d. How many days did you take ICS per week? (0-7)

19. Have you been using ICS since entering the shelter? *If Y, proceed to 19a. If N, continue to 20.*
    a. Specify brand of ICS:
    b. Dose:

20. Were you exposed to the following triggers, before entering the shelter:
    a. Vapours (Y/N)
    b. Chemicals (Y/N)
    c. Stress (Y/N)
    d. Secondhand smoke (Y/N)
    e. Weapons (Y/N)
    f. Odours (Y/N)
    g. Other (specify):

21. Have you been exposed to the following triggers, since entering the shelter:
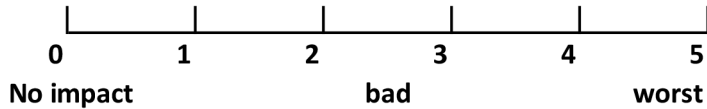   a. Vapours (Y/N)
   b. Chemicals (Y/N)
    c. Stress (Y/N)
    d. Secondhand smoke (Y/N)

    e. Weapons (Y/N)

    f. Odours (Y/N)

    g. Other (specify):

22. On a scale of 0 to 5, how much did your asthma prevent you from living normally before entering the shelter? *(Circle)*

```
|     |     |     |     |     |
0     1     2     3     4     5
No impact         bad         worst
```

23. On a scale of 0 to 5, how much is your asthma preventing you from living normally since entering the shelter? *(Circle)*

```
|     |     |     |     |     |
0     1     2     3     4     5
No impact         bad         worst
```
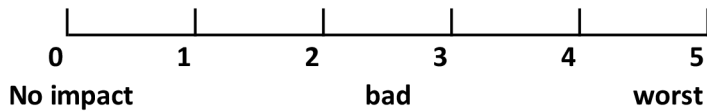
24. Before the war, were your medications free? (Y/N) *If Y, continue to 24a. If N, proceed to 25.*

    a. Name of the medication:

    b. Dose:

25. Are your medications now free? (Y/N) *If Y, continue to 25a. If N, proceed to 26.*

    a. Name of the medication:

    b. Dose:

26. Did you have a severe asthma attack before entering the shelter? (Y/N) *If Y, continue to 26a. If N, proceed to 27.*

    a. Did you go to the ER?

    b. Time to get to an ER at night: (hours, minutes)

27. Have you had a severe asthma attack since entering the shelter? (Y/N) *If Y, continue to 27a. If N, proceed to 28.*

    a. Did you go to the ER?

    b. Time to get to an ER at night: (hours, minutes)

28. Did you have oral or injection corticosteroids available for an emergency (severe asthma attack) at home, before entering the shelter? (Y/N) *If Y, continue to 28a. If N, continue to 29.*

    a. Did you use oral or injection corticosteroids for a severe asthma attack at home, before entering the shelter? (Y/N)

29. Have you had oral or injection corticosteroids available for an emergency (severe asthma attack) at home, since entering the shelter? (Y/N) *If Y, continue to 29a. If N, continue to 30.*

    a. Have you used oral or injection corticosteroids for a severe asthma attack at home, since entering the shelter? (Y/N)

30. Before entering the shelter, did you have a severe asthma attack without access to a hospital? (Y/N)

31. Since entering the shelter, have you had a severe asthma attack without access to a hospital? (Y/N)

Medical and Smoking History

32. Do you have any other medical conditions? (Y/N) *If Y, continue to 32a. If N, proceed to 33.*

    a. Hypertension: (Y/N) *If Y, continue to 32b. If N, proceed to 32c.*

    b. Did you develop hypertension while you were living in the shelter? (Y/N)

    c. Diabetes: (Y/N) *If Y, continue to 32d. If N, proceed to 33.*

    d. Did you develop diabetes while you were living in the shelter? (Y/N)

33. Blood pressure, mmHg (systolic/diastolic):

34. Oxygen saturation, % (SpO_2):

35. Allergic rhinitis (Y/N)?

36. Are you experiencing any symptoms of PTSD? (Y/N) *If Y, continue to 36a. If N, END.*

    a. Physical symptoms (Y/N)

    b. Traumatic flashbacks (Y/N)

    c. Cognitive symptoms (Y/N)

37. List all your current medications:

38. Are you now, or have you ever been a smoker? (Y/N) *If Y, continue to 39. If N, proceed to 43.*

39. Were you a cigarette smoker before entering the shelter? (Y/N) *If N, continue to 40. If Y, proceed to 41.*

40. Have you started smoking cigarettes since entering the shelter? (Y/N)

41. Were you a narghile smoker before entering the shelter? (Y/N) *If N, continue to 42. If Y, proceed to 43.*

42. Have you started smoking narghile since entering the shelter? (Y/N)

43. FOR NON-SMOKERS, BEFORE ENTERING THE SHELTER:

    a. Were you exposed to secondhand cigarette smoke? (Y/N)

    b. Were you exposed to secondhand narghile smoke? (Y/N)

44. FOR NON-SMOKERS, SINCE ENTERING THE SHELTER:

    a. Are you exposed to secondhand cigarette smoke? (Y/N)

    b. Are you exposed to secondhand narghile smoke? (Y/N)

Environment

45. How many people did you share a room with before entering the shelter?

46. How many people do you share a room with since entering the shelter?

Lung Function

47. FEV1% and FEV1/FVC before bronchodilators. *If <80%, continue to 48. If >80%, proceed to 49.*

48. FEV1% and FEV1/FVC after bronchodilators.

49. Before the shelter, did you ever have a runny or blocked nose and sneezing when you did not have a cold?

50. Since entering the shelter, have you had a runny or blocked nose and sneezing when you did not have a cold?

Non-Asthma Group

1. Age (years):

2. Sex: (M/F)

3. Do you have a chronic disease? (Y/N) *If Y, continue to 3a. If N, proceed to 6.*

    a. Diabetes (Y/N)

    b. Hypertension (Y/N)

    c. Other (Y/N)

4. Was your chronic disease diagnosed before entering the shelter? (Y/N) *If N, continue to 5. If Y, proceed to 6.*

5. Was your chronic disease diagnosed since entering the shelter? (Y/N)

6. Were you a cigarette smoker before entering the shelter? (Y/N) *If N, continue to 7. If Y, proceed to 8.*

7. Have you started smoking cigarettes since entering the shelter? (Y/N)

8. Were you a narghile smoker before entering the shelter? (Y/N) *If N, continue to 9. If Y, proceed to 10.*

9. Have you started smoking narghile since entering the shelter? (Y/N)

10. How many people did you share a room with before entering the shelter?

11. Were you exposed to second-hand smoke (cigarettes) before entering to shelter? (Y/N)

12. Were you exposed to second-hand smoke (cigarettes) after entering to shelter? (Y/N)

13. Were you exposed to second-hand smoke (narghile) before entering to shelter? (Y/N)

14. Were you exposed to second-hand smoke (narghile) after entering to shelter? (Y/N)

15. How many people do you share a room with after entering the shelter?

16. Do you experience nighttime episodes of cough, wheezing and breathlessness? (Y/N) *If Y, continue to 16a. If N, proceed to 17.*

    a. Frequency: (weekly/monthly/yearly)

    b. Triggers:

17. FEV1% before bronchodilator *If less than 80%, continue to 17a. If more than 80%, proceed to 18.*

    a. FEV1% after broncodilator (reversibility test):

    b. FEV1/FVC<70% after bronchodilator (obstruction):

18. Were you diagnosed with any chronic respiratory disease before entering the shelter? (Y/N)

19. Blood pressure, mmHg (systolic/diastolic):

20. Oxygen saturation, % (SpO_2):

21. Allergic rhinitis (Y/N)?

22. Are you experiencing any symptoms of PTSD? (Y/N) *If Y, continue to 22a. If N, END.*

    a. Physical symptoms (Y/N)

    b. Traumatic flashbacks (Y/N)

    c. Cognitive symptoms (Y/N)