

Prevalence and Treatment Coverage of Diabetes and Hypertension among Afghan Refugees in Iran: Pilot Study in Sarvestan Camp

Mohammad Javad Moradian, Lambed Tatah, Regina Mendela Duperval, Sabiha Nasrin, Abinet Shiferaw Worke, Jane Osindo, Alaaddin Salih, Mohsen Moghadami, Abd Al rasoul Hemati, Ali Ardalan and Behnaz Rastegarfar

Advisor: Ali Ardalan, Mohsen Moghadami

Start Date: April 2018

Project Summary

This pilot research aimed to improve the care of patients with non-communicable diseases (NCDs) in humanitarian settings, through the provision of data on the prevalence and treatment coverage of two common NCDs, diabetes mellitus (DM) and hypertension (HTN), among the Afghan refugee population in the Islamic Republic of Iran.

NCDs impose a huge burden on human health and are a leading cause of morbidity and mortality worldwide. The situation is particularly worrisome during humanitarian crises where diagnosis, management and treatment of NCDs is challenging. It is, therefore, imperative to provide sound data regarding the prevalence and treatment coverage of NCDs in humanitarian settings, DM and HTN being the most important of the NCDs.

The Islamic Republic of Iran has experienced a massive influx of refugees from Afghanistan over the last three decades. This pilot study was conducted in one of the four registered Afghan refugee camps in Iran. Data was collected by trained local research assistants who after obtaining participant consent to collect data on demographic characteristics, fasting blood sugar and blood pressure. A 276 participants were enrolled in this study. Data was managed on a weekly basis using the SPSS software. Data analysis included descriptive statistics as well as association tests for HTN and DM and demographic characteristics.

The measured outcomes were the prevalence and treatment coverage for HTN and DM. This contributes to the understanding of the extent to which humanitarian organizations are addressing the growing burden of chronic diseases in fragile contexts, and thus improve humanitarian action and international efforts to prevent, control and ultimately reduce the burden of NCDs in the world's most vulnerable populations.

This project was funded by Humanitarian Innovation Initiative (HI2) Watson Institute for International and Public Affairs, Brown University and also Shiraz University of Medical Sciences.

Methods

1. Coordination meeting

The first coordination meeting with local authorities was conducted at April 2018. Since the Primary Health Care (PHC) system in Iran is the representative of Ministry of Health the head of county PHC and his relevant staff were invited for the meeting.



Meeting with local PHC personnel at Shiraz (April 2018)

The objectives of the project was described and the timelines were adjusted according to the local authority's suggestions. One important modification to timelines was to not collect blood samples from participants during the holy month of *Ramzan* (starting 17th May, 2018) since they were fasting. Another important decision that was made in the meeting was that the data collection checklist was adopted from [Package of Essential Noncommunicable \(PEN\)](#), a WHO project which was conducted in Iran 7 times for Iranian citizens and PHC staff are familiar with the checklist. Besides we can compare the results of our project with the National PEN results. The Iranian version of the checklist was translated into English for the project report.

2. Staff recruitment and training

The [camp](#) has a clinic funded by United Nations High Commissioner for Refugees (UNHCR) and supervised by local PHC authorities. The staff include a medical doctor and 4 other healthcare providers, 2 of whom are Afghans living in the camp. The local clinical staff assisted in data collection including measurements of blood pressures, waists and hip circumferences. Laboratory staff coordinated early morning sampling and transferring of blood samples and measuring the fasting blood sugar and cholesterol.

3. Sample Enrollment

The houses are made up of cinder block and each house has a unique code. We agreed that for ethical reasons, the healthcare providers will use that code on the checklists as an identifier to enhance anonymity so the data analyst will not have access to the participants real names.



4. Coordination with local partners

A site visit with local authorities and the research team was done at 24th April 2018. During this visit we introduced the project to the local clinic general practitioner and health care providers who were to help us with data gathering. We reviewed the checklist with them and conducted a pilot case who voluntarily accepted to contribute in the project. The team also visited the camp and talked with a few community members..



Site visit and educating the local clinic staff about the filling the checklist (24th April 2018)

5. Field observation and interviews

The main health concern of the Afghans living in the camp is that they cannot afford the cost of medicines prescribed for them.

In the culture of the Afghans visiting a woman by a man is prohibited. Fortunately the healthcare providers were females.



Gender is important issue in this culture

6. Sample collection

Data Collection through checklists and blood sample collection was started from 7th may 2018. The first session was done by local staff under the direct supervision of MOH experts. A group of 20 people each was invited for early morning blood sampling for fasting blood sugar. A local staff from [Sarvestan hospital](#) (~10 km distance from the camp) was assigned to take blood samples and bring them for testing.



Google map of the Camp and nearby city hospital and PHC system

Information needed for the research was gathered through three steps based on a modified WHO STEPwise approach to noncommunicable disease risk factor surveillance which consist of core items and some extended items. In step 1, a series of interviewer-administered questions were asked about demographic information, general health features and behavioural risk factors. In step 2, blood pressure and anthropometric characteristics such as weight and height were measured. In step 3, blood samples were taken from them and Fasting plasma glucose (FPG) and lipid profile were assessed. A group of 30 participants were invited to the clinic early morning and were told to fast for at least 12 hours in order to be prepared for step 3. Furthermore, Diabetic individuals on medication (tablet or insulin) were reminded not to forget their medications and to bring them to the laboratory for subsequent use after step 3 is accomplished.

6.1. Step 1: Demographic information and Behavioural measurements

Questionnaires were filled out in 6 different domains: demographic information, nutrition, physical activity, tobacco consumption, history of diabetes, and history of high blood pressure. Since alcohol consumption is illegal and banned in Iran, use of alcohol and alcoholic products was not questioned in this step. Demographic information comprised of number of members in the household, house residential area, average household monthly earnings, sex and age.

For nutrition status, numbers of fruit/vegetables consumed in average in a typical day of a week was asked. For physical activity, questions were about quality and quantity of physical activity in three domains of work, transport (walking, hiking or cycling) and recreation. Physical activities during work were divided into Vigorous intensity and moderate intensity ones. Vigorous intensity activities are those which last for at least 10 minutes continuously and cause subjective-perception of severe increase in respiration and heart rate, such as carrying of heavy loads, construction, forestry and drilling. Moderate intensity activities continue for at least 10 minutes and lead to a subjective-perception of slight increase in breathing and heart rate, such as cleaning, washing (by hand), milking cows (by hand), planting and harvesting crops and weaving. In a same way, activity during leisure time was in two kinds: vigorous intensity activities which make you breathe much harder than normal such as soccer, tennis, high-impact aerobics and fast swimming and moderate intensity ones which make you breathe somewhat harder than normal such as cycling, jogging and low-impact aerobics.

In tobacco use domain, their smoking status were questioned. Furthermore, respondents were asked if a medical practitioner or healthcare worker had ever told them that they had Diabetes Mellitus (DM) and Hypertension (HTN).

6.2. Step 2: physical measurements

For assessment of height, the participants were asked to remove their footwears and head gears and those with a high hairdo to press it down. Women's heights were measured by the female staffs so that they would be comfortable to remove their veil or scarf. For accurate measurement of weight, they were asked to wear light clothes the day before and beside the removal of their shoes and head gears, they were asked to empty their pockets. Height and weight were measured by a mechanical telescopic measuring rod (Seca 222, Germany) and a digital scale (EF972, China) respectively.

For Waist circumference (WC) and Hip Circumference (HP), measurements were taken without clothing by the same sex student consecutively. At first, a constant tension tape was set on the midpoint between the lowest palpable rib and the highest part of iliac crest and the subject was asked to relax the arms at the sides, then WC measurement was taken at the end of a normal expiration. Afterwards, the tape was positioned at the widest part of the buttocks and the HC was measured with the arms relaxed at both sides. Blood pressure was measured twice for each participant, one after finishing the Step 1 and the other at the end, when all information had been gathered, a digital automatic sphygmomanometer (ALPK2 K2 1702) was used for the measurement

6.3. Step 3: Biochemical Measurements

A tube containing 5 ml of venous blood sample was gathered from each of the participants in sitting position, afterwards transferred under cold chain condition to the Sarvestan laboratory and serum separated by centrifugation immediately. Fasting Blood Glucose, triglycerides (TG),

total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) were measured using a chemical auto-analyser (Tokyo Boeki Prestige 24i, Japan). For determination of serum levels of FBG and lipid profile, enzymatic colorimetric method and enzymatic methods were used respectively.

7. Definition of variables

Most of the following definitions were adopted from Standard WHO definitions [22,23]:

1. Unhealthy diet or inadequate fruit/vegetable consumption was described as low intake of fruit/vegetable which is less than average 5 servings per day.
2. Insufficient physical activity was considered as not fulfilling 75-minutes of vigorous-intensity physical activity or 150-minute activity of moderate intensity or an equivalent combination of vigorous- and moderate-intensity physical activity achieving 600 MET-minutes during a typical week.
3. Participant those whose Systolic Blood Pressure (SBP) ≥ 140 mm Hg and/or Diastolic Blood Pressure (DBP) ≥ 90 mm Hg and those who are currently on medication for HTN are considered as raised blood pressure group.
4. Raised blood glucose is defined as plasma venous value ≥ 7.0 mmol/L (126 mg/dl) or where the participant is currently on medication for DM.
5. Abdominal obesity is defined as a waist-hip ratio above 0.90 for males and above 0.85 for females.
6. BMI is divided into three ranges: below 25 kg/m², between 25 kg/m² and 30 kg/m² and above 30 kg/m² which are considered as healthy weight, overweight and obese, respectively.
7. Abnormal lipid profile is defined as either of the following: raised total cholesterol (≥ 200 mg/dl), high LDL (≥ 160 mg/dl), low HDL (< 40 mg/dl for men and < 50 mg/dl for women), raised TG (≥ 150 mg/dl)[24].

8. Data statistical analysis

Data were inputted into Statistical Package for the Social Sciences (SPSS) version 24 and then cleaned . The chi-squared test was used for evaluation of the association between behavioural, physical and chemical variables and demographic characteristics (age and sex). A p-value less than 0.05 was considered statistically significant.

9. Ethical consideration

As the refugee population were familiar with the clinic staff, they were explained the purpose and procedure of the study by the staff and then informed consent was obtained from all the participants. Besides, each house in the camp has a unique code which was used by the healthcare providers on the checklists as an identifier to enhance anonymity so the research will not have access to the participants names.

10. Results

10.1. Socioeconomic background

The study population was above 15 years old and are members of 133 families with each family living in a distinct house. This population consist of 114 men with a mean age of 37.4(\pm 17.3) and 162 women with a mean age of 36.1(\pm 13.93). they were divided into 6 groups depending on their age :15–24, 25–34, 35–44, 45–54, 55–64 and above 65 (Table 1).

Most of these families have an average monthly income of less than 70\$ (60.9%), 33.8 % have a monthly income of between 70\$ to 150\$ and only 7 out of 133 (5.3%) earn more than 150\$ monthly. Furthermore, a majority of the houses (78 or 58.6%) in which this population are living have a footprint of between 50 to 100 square meters; houses which are smaller than 50 square meters and those between 100 to 150 square meters account for 33(24.8%) and 22(16.5%) out of 133 respectively.

10.2. Fruits and vegetables consumption

The prevalence of eating less than 5 servings of fruit/vegetables daily was 94.5%; 94.7% for men and 94.4% for women with no statistically significant difference between these two groups($p>0.05$). In different age groups of the population, percentages of individuals consuming inadequate fruit/vegetables are above 90% and it reaches the most in those more than 65 years old,100%; similar to sex, there is no significant association between age and unhealthy diet($p>0.05$) (table 2).

10.3. Physical activity

The overall prevalence of insufficient physical activity was 18.1 % which is higher in women (22.8%, 37 individuals) than men (11.4%, 13 individuals) with statistically significant difference between these two groups($p=0.015$). Furthermore, the highest rate of physical inactive population is among those 65 years old and over (33.3%); no statistically significant relationship between age groups and low level of physical activity was detected($p>0.05$) (table 2).

10.4. Tobacco use

The overall prevalence of current tobacco consumption both smoked and smokeless tobacco products was 9.4% with statistically significant higher proportion for males (18.4%, 21 individuals) than females (3%, 5 individuals) ($p=0.000$); 17 out of them (65.3%) were consuming Naswar, a smokeless tobacco product and the rest were on cigarettes and hookah. The prevalence is higher in those aged 55 to 64 years, 11.1%, followed by a younger population, aged between 25 and 34 years old, 10.3%. There are not any statistically significant differences between different age groups in the percentage of individuals using tobacco products ($p>0.05$) (table 2).

10.5. Blood sugar

A total of 2.8% (8 individuals) have raised BS; 1.7% (2 individuals) males and 3.7% (6 individuals) females; of those, 6 individuals were informed about their diabetes and were receiving medication. Overall, the prevalence of participants with raised BS was much higher in the age group of 45-54 years old, half of the total. Opposite to sex, age has a statistically significant relationship with percentage of raised BS individuals ($p=0.002$) (table 2).

10.6. Blood pressure

In the target population, 19.9% (55 individuals) were detected having raised BP, 21.9% (25 individuals) men and 18.5% (30 individuals) with no statistically significant difference ($p>0.05$). Ten participants out of them were unaware of having raised BP. The percentage of those having raised BP had a statistically significant relationship with the age ($p=0.000$) and the percentages, with the age increasing, were getting higher, reaching its highest in the individuals who were 65 years old and over (61.1%, 11 individuals) (table 2).

10.7. Abdominal obesity

The prevalence of central obesity was 51.2% which was statistically significant higher in women (59.2%, 96 individuals) than men (39.4%, 45 individuals) ($p=0.001$). There was also a statistically significant relationship between various age groups and the prevalence ($p=0.000$); much higher in middle-aged population than younger ones (table 2).

10.8. Overweight and obesity

In the current study, the overall prevalence of overweight or obesity was 24.6% in women and 19.9%, in men. More than half of the individuals with healthy weight (53.5 %) were men. Both age and sex were associated with the different status of BMI (both $p=0.000$) (table 3).

10.9. Lipid profile

In the target population, out of 276 examined persons 163 (59.05 %) has at least one abnormality in lipid profile components (high TG, total cholesterol or LDL-C and low HDL-C). It was indicated that sex is statistically significant associated to the status of lipid profile ($p=0.000$), as the prevalence of the abnormal profiles among women was more than the men. In contrast, age didn't have a statistically significant relationship with the lipid profile status ($p=0.724$); however, the prevalence increased with increase in age from youngsters to middle-aged population (table 4).

11. Discussion

Nowadays, noncommunicable diseases (NCDs) are considered as one of the most dreadful threats of humankind which are responsible for nearly 70 % of all deaths in the world, equivalent to 41 million each year [25]. Furthermore, NCDs pose heavy financial burden and catastrophic health-care associated expenditure and leads to dramatic reductions in life satisfaction and quality of life. All countries and regions are touched by devastating social and economic impact of this alarming public health challenge and it continues to increase with a stunning speed and sweep, disproportionately in poor, vulnerable populations of low- and middle-income regions where more than 75 % of all NCD-related deaths take place [26,25].

Seven rounds of the large-scale studies of surveillance of risk factors of NCDs have been conducted in Iran since 2005 and the last one was in 2016. However, STEPS surveys have not been conducted among refugee populations in Iran yet and this study is the first study that aims at the collection of data about profile of lifestyle and metabolic risk factors of NCDs: unhealthy diet, insufficient physical activity, tobacco consumption, raised blood pressure, raised blood glucose, abdominal obesity, being overweight or obese, and abnormal lipid profile.

11.1. Unhealthy diet

Adequate consumption of fruit and vegetables is shown to have strong association with reduced risk of all-cause mortality, particularly NCDs such as cardiovascular mortality[27], diabetes[28] and cancers[29]. Besides, it has been estimated that low intake of fruits and vegetables account for 4.7% of the global disease burden[30]. Nowadays in almost all countries of the world, it is reported that a large proportion of the society consume less than 5 servings in a typical day[31]. Likewise in the current study, diets of only 6.5% of the target population meet the recommendation posited by world health organization; this percentage is extremely low even when comparing it with prevalence of appropriate fruit/vegetable consumption at provincial and national level, both near 19.5%[32]. The national percentage had more than doubled from 8.66% in 2006[33] to 19.44% in 2016. Despite this upward trend, these percentages are still low suggesting the need for better management for the removal or lessening of barriers associated with achieving the recommended guidelines in order to have a healthy diet; one of the most important barriers is the lack of knowledge about the recommended daily intake; almost all the refugee population of our study were not aware of that and they thought that 2-3 servings per

day satisfy their need for a healthy diet. Affordability of fruit and vegetables is another determinant of fruit and vegetable intake which has been exacerbated due to inflation and currency collapse as a result of Iran's economic crisis.

11.2. Physical inactivity

Low level of physical activity is counted as one of the most powerful risk factors of NCDs, which is associated with higher levels of DM, various cancers and cardiovascular complications such as coronary artery diseases, cerebrovascular accidents, myocardial infarction and HTN; furthermore, low physical activity is supposed not to only increase physical morbidity but also to lead to increased risk of mental disorders such as depression[34,35]. Data from global NCD report indicate that approximately a quarter of the global population (23 %) have suboptimal physical activity[36]; additionally the prevalence of insufficient physical activity in the Eastern Mediterranean Region population was reported to be among the highests with 35 percent[36]. However, the rate is still higher in Iran at national and Fars provincial level, 56.17% and near 57 %, respectively[32]. Despite this high rate, the overall prevalence of individuals with low level of physical activity in the study population was 18.1 %. One factor contributing to this is that unlike the locals, refugees are more forced, by necessity, to involve in undoable and unwanted jobs and work in troublous conditions demanding more physical activity and energy such as carrying of heavy loads, construction, drilling and mining. Furthermore, this population by far have fewer facilities which lessen physical activity and give rise to a sedentary lifestyle such as TV, mobile, PlayStation etc. Besides, in this study, it has been shown that the prevalence of suboptimal physical activity is higher among the women; one important factor associated to this is that in the target population, it is commonly perceived that the fathers are breadwinners of the family and the mothers are dependent homemaker and this belief restrict women's physical activity mainly to indoor activities.

11.3. Tobacco consumption

Nowadays, tobacco is considered as one of the leading causes of morbidity and mortality worldwide which is responsible for more than 7 million deaths annually[37,38]. Furthermore, in 2015, tobacco use was estimated to cause 6.9% of the global disease burden[30]. Overall, it was indicated that 9.4% (26 individuals) of adults over 15 years in our study, use tobacco and of those only 9 persons (3.26% of the target population) smoke tobacco; generally, smoking is not a common habit among the refugee adult population compared with the native population instead they are more interested in a smokeless dipping tobacco called Naswar. Close to 18 percent of the locals in Fars province are current tobacco smokers, which is approximately six times higher than the prevalence of smoking reported in our study. Naswar is highly blamed for increasing the chance of oral and nasopharyngeal cancers[39,40], while smoking tobacco is associated with increased risk of several cancers such as lung cancer, laryngeal cancers and pancreatic cancer[41]. Additionally, smoking can lead to several NCDs such as malnutrition, cardiovascular diseases, diabetes and chronic obstructive pulmonary disease [41,42].

11.4. Raised blood glucose

Diabetes is a well-recognized threat to the health globally and could lead to majority of NCDs known as macrovascular and microvascular complications such as retinal, neural and renal involvement, cardiovascular diseases, diabetic ulcers and etc [43,44]. Besides, nearly half of the people with diabetes (49%) are not aware of their morbid condition [45], so remain uncontrolled and this can pose heavier burdens for them and for the society. Among WHO's 6 regions, it has been reported that the Eastern Mediterranean Region has the highest prevalence of diabetes (14%)[46]; furthermore, according to International Diabetes Federation (IDF) in the countries in middle east and north Africa, prevalence estimates of diabetes ranges from 3.5% in Yemen to 18.2% in Saudi Arabia, with Iran ranked 13th in prevalence estimates of diabetes(8.7 %) and third in number of people with diabetes after Egypt and Pakistan 8,491,029, 7,656,317, 5,108,254, respectively[45]. While higher rates of individuals are reported in the province (closely to 10%)[32], our data indicated that there are dramatically lower prevalence of those with raised blood glucose in our population, 2.8% and no one was detected to be afflicted with DM type I, suggesting that this population has fewer risk factors for development of DM, as reported in this study that there are higher rates of physical activity and lower rates of obesity, central obesity and abnormal lipid profile in the population.

11.5. Raised blood pressure

Globally, the raised blood pressure continues to be a devastating silent killer, involving about 22% of adults aged 18 years and over (23% males, 21 females)[11]. Based on Disability Adjusted Life Years (DALYs) measures in 2015, 8.6% of global disease burden is attributed to the raised blood pressure[30]. Hypertension, is the leading risk factor for developing cardiovascular events such as stroke and ischemic heart disease- the number one cause of death globally in the last 15 years[47,48]. According to WHO reports, Ischemic heart disease and stroke accounts for 15.2 million deaths in 2016[48]. Furthermore, from other long-term complications of hypertension, hypertensive nephropathy, dementia, vision loss, cerebrovascular damage could be pointed[49-52]. A series of previous local studies has highlighted the growing trend of hypertension prevalence at national level, demonstrating its great growth from 17.36% in 2006 to 26.3% in 2016[32,53]. The statistical data showed higher prevalence of hypertension in the older age group[32]. The provincial statistics demonstrated that 22.5% of general population (22.6% males, 22.4% females) were been suffering from the raised blood pressure[32]. Likewise, our data analysis illustrated the high prevalence of hypertension in our target population (19.9%). Diabetes, tobacco use, unhealthy diet, raised BMI, and abnormal lipid profile were of hypertension predisposing factors found in our target population.

11.6. Obesity and overweight

Obesity and overweight are two preventable medical conditions which are common, serious and costly[54]. The risk of non- communicable diseases such as cardiovascular attacks, which were

by far the global leading cause of death in 2016[48], diabetes, musculoskeletal disorders, and some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon) is highly associated with raised BMI[55]. Overweight and obesity are known to cause about 4.9% of the global disease burden[30]. Another poor prognostic factor for developing non-communicable diseases such as metabolic syndrome, Alzheimer disease, asthma, diabetes, heart diseases is central obesity whether calculated based on waist circumference or waist-to-hip ratio[56-60]. Consecutive studies has shown that this factor even may be a more powerful determinant in prognosing subsequent risk of developing knee osteoarthritis, type 2 diabetes mellitus, cardiovascular events than BMI[61-63]. Obesity has been shown to have a surprisingly growing trend, as the WHO reports that global obesity has approximately tripled since 1975[55]. Our national percentages of obesity and overweight, also, followed this pattern, as it was grown from 15.17% in 2005 to 23% in 2016 and from 29.27% in 2005 to 37% in 2016, respectively[32,53]. The provincial statistics showed that the overweight definition could be applied to approximately 36.8% of the general population (37% males, 36.6% females) and obesity definition to 20.8% of the general population (13.6% males, 28% females)[32], both of which were higher than their counterpart percentages among refugees. Similarly, the national and provincial distributions of abdominal obesity were 62.87% and 64% (62% males, 66% females), respectively[32], which is again by far higher than that of refugees (51.2%), somehow reflecting their different lifestyles; a more active jobs and a less passive hobbies.

11.7. Abnormal lipid profile

Abnormal lipid profile is of neglected medical disorders which is considered a powerful indicator of subsequent NCDs[64]. Hypercholesterolemia has been reported to involve more than at least one- fifth of world population with higher percentages in Europe (54%) and America (48%) and lower percentages in South-East Asia (30%) and Africa (23%)[65]. WHO investigations in 2015 revealed that 3.6% of the global disease burden could be attributed to raised total cholesterol[30]. LDL and HDL levels are the other components of lipid panel that their ratio are even more reliable biomarkers for assessing risk factors for developing diseases than total cholesterol level since almost all part of blood cholesterol is made up from HDL and LDL particles, which has been proved to have opposite behaviours against each other on coronary artery disease development[66,67]. Studies has shown that only 1 mg/dl increase in HDL level is associated with 2-3% decrease in cardiovascular events[68]. An elevated triglyceride level is another type of abnormal lipid panel which can accompany other mentioned lipid profile abnormalities[69]. Lipid triad or atherogenic lipoprotein phenotype is one example of this combination which denotes to a triad of hypertriglyceridemia, raised the level of LDL particles, and decreased level of HDL particles[70]. Abnormalities in each of these four components of lipid profile has been found to take part in pathogenesis of various disorders such as metabolic syndrome, type 2 diabetes, and atherosclerotic changes[71-74]. According to the large-scale cross-sectional study performed in 2016, the national and provincial distributions of hypertriglyceridemia was found to be 27.8% (30.8% males, 26.6% females) and 28.7%, respectively[32], being by far higher than their counterpart prevalence in the refugee population (13.04%). This significant difference may originate from this point that habitudes such as dietary

patterns (e.g., fast foods, junk foods, and high salt meals) and lifestyle choices (e.g., sedentary workplace, passive hobbies) have not been yet introduced in the refugee's life pattern.

12. Conclusion

Tackling the growing burden of NCDs is considered as one of the most problematic areas of healthcare management especially in populations with low income level. This needs complete knowledge of the current local status of NCDs prevalence and its associated risk factors; so, there is a high demand for these kinds of studies; our study was the first round of STEPS surveys in refugee population of Sarvestan camp and it should be repeated in future. Overallly, our study indicated that, expect for dietary risk factor, inadequate fruits and vegetable intake, prevalence of other risk factors is lower than its counterpart in provincial and national level. However, this does not underestimate the importance of different types of behavioural, physical and biochemical risk factors, but just accentuate the fact that improving nutritional status does deserve more consideration in this population and the actions should primarily gear to this issue; fortunately, removing or reducing this risk factor is much feasible than those related to lifestyle. Raising awareness about the healthy diet and its importance and provision of more affordable fruit and vegetables are of two effective steps toward improvement of this dietary status.

13. Annex

Age groups	Frequency	Percent
15-24	69	25.0
25-34	87	31.5
35-44	45	16.3
45-54	30	10.9
55-64	27	9.8
above 65	18	6.5
Total	276	100.0

Table 1. different age groups of the population

groups	Behavioral and physical variables-number(percentage)							
	Fruit/vegetable< 5 serving	Insufficient physical activity	Tobacco use	Known diabetes	Raised BS	Known HTN	Raised BP	Abdominal obesity
Age 15-24	65(94.2)	11(15.9)	7(10.1)	0(0)	0(0)	1(1.4)	2(2.8)	20(28.9)
25-34	79(90.8)	14(16.09)	9(10.3)	0(0)	0(0)	3(3.44)	5(5.7)	39(44.8)

35-44	44(97.7)	8(17.7)	3(6.6)	1(2)	1(2)	9(20)	12(26.6)	29(64.4)	
45-54	29(96.6)	5(16.6)	3(10)	4(13.3)	4(13.3)	9(30)	11(36.6)	20(66.6)	
55-64	26(96.2)	6(22.2)	3(11.1)	2(7.4)	2(7.4)	13(48.1)	14(51.8)	24(88.8)	
above 65	18(100)	6(33.3)	1(5.5)	0(0)	1(5.5)	10(55.5)	11(61.1)	9(50)	
P value	0.445	0.605	0.967	0.007	0.002	0.000	0.000	0.000	
Sex	Men	108(94.7)	13(11.4)	21(18.4)	1(0.8)	2(1.7)	16(14.03)	25(21.9)	45(39.4)
	Women	153(94.4)	37(22.8)	5(3)	6(3.7)	6(3.7)	29(17.9)	30(18.5)	96(59.2)
	Both sexes	261(94.5)	50(18.1)	26(9.4)	7(2.5)	8(2.8)	45(16.3)	55(19.9)	141(51.2)
P value	0.91	0.015	0.000	0.169	0.342	0.392	0.485	0.001	

Table 2. Behavioral and physical risk factors for noncommunicable diseases by age and sex group

groups		Healthy weight	Overweight	Obese
Age(year)	15-24	57(82.6)	5(7.24)	7(10.1)
	25-34	44(50.5)	26(29.8)	17(19.5)
	35-44	16(35.5)	14(31.1)	15(33.3)
	45-54	15(50)	7(23.3)	8(26.6)
	55-64	8(29.6)	13(48.1)	6(22.2)

	above 65	13(72.2)	3(16.6)	2(11.1)
P value		0.000		
Sex	Men	82(71.9)	21(18.4)	11(9.6)
	Women	71(43.8)	47(29.01)	44(27.1)
	Both sexes	153(55.4)	68(24.6)	55(19.9)
P value		0.000		

Table 3. Prevalence of weight groups among various age and sex group

groups		Biochemical components-number(percentage)				
		Raised total cholesterol	Raised TG	High LDL	Low HDL	Abnormal lipid profile
Age(year)	15-24	13(18.8)	2(2.89)	0(0)	29(42.02)	36(52.1)
	25-34	18(20.6)	14(16.09)	3(3.4)	34(39.08)	52(59.7)
	35-44	13(28.8)	10(22.22)	3(6.6)	20(44.44)	27(60)
	45-54	14(46.6)	5(16.66)	1(3.3)	9(30)	20(66.6)
	55-64	10(37.03)	2(7.40)	1(3.7)	15(55.55)	18(66.6)
	above 65	4(22.2)	3(16.6)	1(5.5)	6(33.33)	10(55.5)
P value		0.038	0.040	0.506	0.455	0.724

Sex	Men	31(27.1)	13(11.4)	3(2.6)	19(16.6)	52(45.6)
	Women	41(25.3)	23(14.1)	6(3.7)	94(58.02)	111(68.5)
	Both sexes	72(26.08)	36(13.04)	9(3.2)	113(40.9)	163(59.05)
P value		0.726	0.497	0.621	0.000	0.000

Table 4. biochemical risk factors for noncommunicable diseases by age and sex group

14. References

1. Matlin SA, Depoux A, Schütte S, Flahault A, Saso L (2018) Migrants' and refugees' health: towards an agenda of solutions. *Public Health Reviews* 39:27. doi:10.1186/s40985-018-0104-9
2. Silove D, Steel Z, Bauman A, Chey T, McFarlane A (2007) Trauma, PTSD and the longer-term mental health burden amongst Vietnamese refugees : a comparison with the Australian-born population. *Social psychiatry and psychiatric epidemiology* 42 (6):467-476. doi:10.1007/s00127-007-0194-z
3. Vaage AB, Thomsen PH, Silove D, Wentzel-Larsen T, Van Ta T, Hauff E (2010) Long-term mental health of Vietnamese refugees in the aftermath of trauma. *The British journal of psychiatry : the journal of mental science* 196 (2):122-125. doi:10.1192/bjp.bp.108.059139
4. Giallo R, Riggs E, Lynch C, Vanpraag D, Yelland J, Szwarc J, Duell-Piening P, Tyrell L, Casey S, Brown SJ (2017) The physical and mental health problems of refugee and migrant fathers: findings from an Australian population-based study of children and their families. *BMJ open* 7 (11):e015603. doi:10.1136/bmjopen-2016-015603
5. Ackerman LK (1997) Health problems of refugees. *The Journal of the American Board of Family Practice* 10 (5):337-348
6. Cronin AA, Shrestha D, Spiegel P, Gore F, Hering H (2009) Quantifying the burden of disease associated with inadequate provision of water and sanitation in selected sub-Saharan refugee camps. *Journal of water and health* 7 (4):557-568. doi:10.2166/wh.2009.089
7. Abbas M, Aloudat T, Bartolomei J, Carballo M, Durieux-Paillard S, Gabus L, Jablonka A, Jackson Y, Kaojaroen K, Koch D, Martinez E, Mendelson M, Petrova-Benedict R, Tsiodras S, Christie D, Saam M, Hargreaves S, Pittet D (2018) Migrant and refugee populations: a public health and policy perspective on a continuing global crisis. *Antimicrobial resistance and infection control* 7:113. doi:10.1186/s13756-018-0403-4
8. Rehr M, Shoab M, Ellithy S, Okour S, Ariti C, Ait-Bouziad I, van den Bosch P, Deprade A, Altarawneh M, Shafei A, Gabashneh S, Lenglet A (2018) Prevalence of non-communicable diseases and access to care among non-camp Syrian refugees in northern Jordan. *Conflict and health* 12:33. doi:10.1186/s13031-018-0168-7
9. Agyemang C, van den Born BJ (2018) Non-communicable diseases in migrants: an expert review. *Journal of travel medicine*. doi:10.1093/jtm/tay107
10. de Rooij L, Wascher D, Paulissen M (2016) Sustainable Design Principles for Refugee Camps. Wageningen Environmental Research,
11. Organization WH (2014) Global status report on noncommunicable diseases 2014.
12. Lopez AD, Murray CC (1998) The global burden of disease, 1990–2020. *J Nature medicine* 4 (11):1241
13. Engelgau MM, Sampson UK, Rabadan-Diehl C, Smith R, Miranda J, Bloomfield GS, Belis D, Narayan KMV, National Health L, Blood Institute–UnitedHealth Global Health Centers of Excellence C (2016) Tackling NCD in LMIC: Achievements and Lessons Learned From the NHLBI-UnitedHealth Global Health Centers of Excellence Program. *Global heart* 11 (1):5-15. doi:10.1016/j.ghheart.2015.12.016
14. De Maeseneer J, Roberts RG, Demarzo M, Heath I, Sewankambo N, Kidd MR, van Weel C, Egilman D, Boelen C, Willems S (2012) Tackling NCDs: a different approach is needed. *Lancet (London, England)* 379 (9829):1860-1861. doi:10.1016/s0140-6736(11)61135-5
15. Nethan S, Sinha D, Mehrotra R Non Communicable Disease Risk Factors and their Trends in India. *Asian Pacific journal of cancer prevention : APJCP* 18 (7):2005-2010. doi:10.22034/APJCP.2017.18.7.2005

16. Hoodfar H (2008) The Long Road Home: Adolescent Afghan Refugees in Iran Contemplate 'Return. *J Years of Conflict: Adolescence, Political Violence Displacement* 25:165
17. Maleki S, Cowan L (2017) Iran, Factsheet, 1 July 2017.
18. Abbasi-Shavazi M, Glazebrook D, Mahmoudian H, Jamshidiha G, Sadeghi R (2005) Return to Afghanistan? A study of Afghans living in Tehran, Mashhad, and Zahedan. Retrieved October 30 th 2016.
19. Tober DM, Taghdisi MH, Jalali M (2006) "Fewer children, better life" or "as many as God wants"? Family planning among low-income Iranian and Afghan refugee families in Isfahan, Iran. *Medical anthropology quarterly* 20 (1):50-71
20. Zahedi A (2007) Transnational marriages, gendered citizenship, and the dilemma of Iranian women married to Afghan men. *J Iranian Studies* 40 (2):225-239. doi:10.1080/00210860701269568
21. Organization WH The STEPS Instrument and Support Materials, 2013.
22. Riley L, Guthold R, Cowan M, Savin S, Bhatti L, Armstrong T, Bonita R (2016) The World Health Organization STEPwise Approach to Noncommunicable Disease Risk-Factor Surveillance: Methods, Challenges, and Opportunities. *American journal of public health* 106 (1):74-78. doi:10.2105/ajph.2015.302962
23. WHO (2017) WHO STEPS Surveillance Manual.
24. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report (2002). *Circulation* 106 (25):3143-3421
25. World health organization (2018) Noncommunicable diseases. <https://www.who.int/news-room/factsheets/detail/noncommunicable-diseases>.
26. Gowshall M, Taylor-Robinson SD (2018) The increasing prevalence of non-communicable diseases in low-middle income countries: the view from Malawi. *International journal of general medicine* 11:255-264. doi:10.2147/IJGM.S157987
27. Wang X, Ouyang Y, Liu J, Zhu M, Zhao G, Bao W, Hu FB (2014) Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ (Clinical research ed)* 349:g4490. doi:10.1136/bmj.g4490
28. Harding AH, Wareham NJ, Bingham SA, Khaw K, Luben R, Welch A, Forouhi NG (2008) Plasma vitamin C level, fruit and vegetable consumption, and the risk of new-onset type 2 diabetes mellitus: the European prospective investigation of cancer--Norfolk prospective study. *Archives of internal medicine* 168 (14):1493-1499. doi:10.1001/archinte.168.14.1493
29. Wiseman MJ PotNS (2008) The second world cancer research fund/american institute for cancer research expert report. Food, nutrition, physical activity, and the prevention of cancer: A global perspective: Nutrition society and bapen medical symposium on 'nutrition support in cancer therapy'. 67 (3):253-256
30. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015 (2016). *Lancet (London, England)* 388 (10053):1659-1724. doi:10.1016/s0140-6736(16)31679-8
31. Berg CJ, Daley CM, Nazir N, Kinlacheeny JB, Ashley A, Ahluwalia JS, Greiner KA, Choi WS (2012) Physical activity and fruit and vegetable intake among American Indians. *Journal of community health* 37 (1):65-71. doi:10.1007/s10900-011-9417-z
32. education IroImoham (2016) Atlas of non-communicable diseases risk-factors surveillance in the Islamic republic of Iran-STEPs 2016, .
33. education IroImoham (2006) IRAN STEPS Survey 2006
34. Organization WH (2010) Global recommendations on physical activity for health.

35. Chakravarthy MV, Joyner MJ, Booth FW (2002) An obligation for primary care physicians to prescribe physical activity to sedentary patients to reduce the risk of chronic health conditions. *Mayo Clinic proceedings* 77 (2):165-173. doi:10.4065/77.2.165
36. Organization WH (2018) Prevalence of insufficient physical activity. Adults aged +18 years
37. Organization WH (2013) WHO report on the global tobacco epidemic, 2013: enforcing bans on tobacco advertising, promotion and sponsorship. World Health Organization,
38. organization Wh (2017) Implement the WHO Framework Convention on Tobacco Control and the MPOWER measures to reduce tobacco use. <http://www.emro.who.int/tfi/news/who-fctc-and-mpower.html>.
39. Khan Z, Suliankatchi RA, Heise TL, Dreger S (2019) Naswar (Smokeless Tobacco) Use and the Risk of Oral Cancer in Pakistan: A Systematic Review With Meta-Analysis. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco* 21 (1):32-40. doi:10.1093/ntr/ntx281
40. Saleem S, Azhar A, Hameed A, Khan MA, Abbasi ZA, Qureshi NR, Ajmal M (2013) P53 (Pro72Arg) polymorphism associated with the risk of oral squamous cell carcinoma in gutka, niswar and manpuri addicted patients of Pakistan. *Oral oncology* 49 (8):818-823. doi:10.1016/j.oraloncology.2013.04.004
41. Eriksen M, Mackay J, Ross HJIA, GA, USA (2012) The tobacco atlas: American cancer society.
42. West R (2017) Tobacco smoking: Health impact, prevalence, correlates and interventions. *Psychology & health* 32 (8):1018-1036. doi:10.1080/08870446.2017.1325890
43. Papatheodorou K, Papanas N, Banach M, Papazoglou D, Edmonds M (2016) Complications of Diabetes 2016. *Journal of diabetes research* 2016:6989453-6989453. doi:10.1155/2016/6989453
44. Chawla A, Chawla R, Jaggi S (2016) Microvascular and macrovascular complications in diabetes mellitus: Distinct or continuum? *Indian journal of endocrinology and metabolism* 20 (4):546-551. doi:10.4103/2230-8210.183480
45. Cho N, Shaw J, Karuranga S, Huang Y, da Rocha Fernandes J, Ohlrogge A, Malanda BJD, practice c (2018) IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. 138:271-281
46. Organization WH (2016) Global report on diabetes: World Health Organization. Geneva,
47. Drozd D, Kawecka-Jaszcz K (2014) Cardiovascular changes during chronic hypertensive states. *Pediatric nephrology (Berlin, Germany)* 29 (9):1507-1516. doi:10.1007/s00467-013-2614-5
48. World Health Organization (2018) The top 10 causes of death.
49. Sternlicht H, Bakris GL (2017) The Kidney in Hypertension. *The Medical clinics of North America* 101 (1):207-217. doi:10.1016/j.mcna.2016.08.001
50. Perrotta M, Lembo G, Carnevale D (2016) Hypertension and Dementia: Epidemiological and Experimental Evidence Revealing a Detrimental Relationship. *International journal of molecular sciences* 17 (3):347-347. doi:10.3390/ijms17030347
51. Bhargava M, Ikram MK, Wong TY (2012) How does hypertension affect your eyes? *Journal of human hypertension* 26 (2):71-83. doi:10.1038/jhh.2011.37
52. Meissner A (2016) Hypertension and the Brain: A Risk Factor for More Than Heart Disease. *Cerebrovascular diseases (Basel, Switzerland)* 42 (3-4):255-262. doi:10.1159/000446082
53. Dr Ahmad Kousha DKE, Dr Jalil Kouhpayezadeh, Dr Kambiz Abachizadeh, Ali Rafei, Fereshteh Salavati, Mahboobeh Darman, Parisa Rezanejad, Abbas Pariani (2011) Iran NCD Risk Factors STEPs Report.
54. Ofei F (2005) Obesity - a preventable disease. *Ghana medical journal* 39 (3):98-101
55. World Health Organization (2018) Obesity and overweight. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
56. Anjana M, Sandeep S, Deepa R, Vimalaswaran KS, Farooq S, Mohan V (2004) Visceral and central abdominal fat and anthropometry in relation to diabetes in Asian Indians. *Diabetes care* 27 (12):2948-2953
57. Thomson CC, Clark S, Camargo CA, Jr. (2003) Body mass index and asthma severity among adults presenting to the emergency department. *Chest* 124 (3):795-802

58. Razay G, Vreugdenhil A, Wilcock G (2006) Obesity, abdominal obesity and Alzheimer disease. *Dementia and geriatric cognitive disorders* 22 (2):173-176. doi:10.1159/000094586
59. Despres JP, Lemieux I (2006) Abdominal obesity and metabolic syndrome. *Nature* 444 (7121):881-887. doi:10.1038/nature05488
60. Fan H, Li X, Zheng L, Chen X, Lan Q, Wu H, Ding X, Qian D, Shen Y, Yu Z, Fan L, Chen M, Tomlinson B, Chan P, Zhang Y, Liu Z (2016) Abdominal obesity is strongly associated with Cardiovascular Disease and its Risk Factors in Elderly and very Elderly Community-dwelling Chinese. *Scientific reports* 6:21521-21521. doi:10.1038/srep21521
61. Ghroubi S, Elleuch H, Guermazi M, Kaffel N, Feki H, Abid M, Baklouti S, Elleuch MH (2007) [Abdominal obesity and knee osteoarthritis]. *Annales de readaptation et de medecine physique : revue scientifique de la Societe francaise de reeducation fonctionnelle de readaptation et de medecine physique* 50 (8):661-666. doi:10.1016/j.annrmp.2007.03.005
62. Yusuf S, Hawken S, Ounpuu S, Bautista L, Franzosi MG, Commerford P, Lang CC, Rumboldt Z, Onen CL, Lisheng L, Tanomsup S, Wangai P, Jr., Razak F, Sharma AM, Anand SS (2005) Obesity and the risk of myocardial infarction in 27,000 participants from 52 countries: a case-control study. *Lancet (London, England)* 366 (9497):1640-1649. doi:10.1016/s0140-6736(05)67663-5
63. Hajian-Tilaki K, Heidari B (2015) Is waist circumference a better predictor of diabetes than body mass index or waist-to-height ratio in Iranian adults? *International journal of preventive medicine* 6:5-5. doi:10.4103/2008-7802.151434
64. Baghbani-Oskouei A, Tohidi M, Asgari S, Ramezankhani A, Azizi F, Hadaegh F (2018) Serum Lipids During 20 Years in the Tehran Lipid and Glucose Study: Prevalence, Trends and Impact on Non-Communicable Diseases. *International journal of endocrinology and metabolism* 16 (4 Suppl):e84750-e84750. doi:10.5812/ijem.84750
65. World Health Organization (2011) Global status report on noncommunicable diseases 2010
Description of the global burden of NCDs, their risk factors and determinants.
66. Millán J, Pintó X, Muñoz A, Zúñiga M, Rubiés-Prat J, Pallardo LF, Masana L, Mangas A, Hernández-Mijares A, González-Santos P, Ascaso JF, Pedro-Botet J (2009) Lipoprotein ratios: Physiological significance and clinical usefulness in cardiovascular prevention. *Vascular health and risk management* 5:757-765
67. Wilson PW (1990) High-density lipoprotein, low-density lipoprotein and coronary artery disease. *The American journal of cardiology* 66 (6):7a-10a
68. Rajagopal G, Suresh V, Sachan A (2012) High-density lipoprotein cholesterol: How High. *Indian journal of endocrinology and metabolism* 16 (Suppl 2):S236-S238. doi:10.4103/2230-8210.104048
69. Li S, Guo Y-L, Zhao X, Zhang Y, Zhu C-G, Wu N-Q, Xu R-X, Qing P, Gao Y, Li X-L, Sun J, Liu G, Dong Q, Li J-J (2017) Novel and traditional lipid-related biomarkers and their combinations in predicting coronary severity. *Scientific reports* 7 (1):360-360. doi:10.1038/s41598-017-00499-9
70. Rizzo M, Berneis K (2005) Lipid triad or atherogenic lipoprotein phenotype: a role in cardiovascular prevention? *Journal of atherosclerosis and thrombosis* 12 (5):237-239
71. Nelson RH (2013) Hyperlipidemia as a risk factor for cardiovascular disease. *Primary care* 40 (1):195-211. doi:10.1016/j.pop.2012.11.003
72. Sherpa LY, Deji, Stigum H, Chongsuvivatwong V, Luobu O, Thelle DS, Nafstad P, Bjertness E (2011) Lipid profile and its association with risk factors for coronary heart disease in the highlanders of Lhasa, Tibet. *High altitude medicine & biology* 12 (1):57-63. doi:10.1089/ham.2010.1050
73. Davis PJ, Liu M, Sherman S, Natarajan S, Alemi F, Jensen A, Avramovic S, Schwartz MD, Hayes RB (2018) HbA1c, lipid profiles and risk of incident type 2 Diabetes in United States Veterans. *PLoS one* 13 (9):e0203484-e0203484. doi:10.1371/journal.pone.0203484
74. Mohammadbeigi A, Farahani H, Moshiri E, Sajadi M, Ahmadli R, Afrashteh S, Khazaei S, Ansari H (2018) Prevalence of Metabolic Syndrome and Associations with Lipid Profiles in Iranian Men: A

Population-Based Screening Program. The world journal of men's health 36 (1):50-56.
doi:10.5534/wjmh.17014