



Cohort Profile

Cohort Profile: The Yazd Health Study (YaHS): a population-based study of adults aged 20–70 years (study design and baseline population data)

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Introduction

Yazd Health Study (YaHS) is a population-based cohort study of 9962 individuals aged 20–70 years, established in November 2014 in the Greater Yazd Area. This study aims to investigate the changing incidence of a variety of chronic illnesses and associated risk factors in an area with one of the highest rate of chronic illnesses in Iran. The family history of major non-communicable diseases (NCDs) is collected to investigate the pedigree of patients in the Yazd population. A biobank is established to collect blood and extract DNA samples from the participants for future genetic epidemiology studies. Geocoding of all participants is performed to prepare a database for spatial epidemiology investigation.

At baseline, trained interviewers collected detailed information on personal and dietary habits, physical activity, medical history, mental health status and social well-being of the participants and also anthropometric measurements (response rate = 94.9%). All participants were invited to attend a referral laboratory to provide blood samples and 4010 (40%) of them did so. In the second phase of the study commencing in November 2015, the Yazd biobank (Zist Bank-e-Yazd-ZIBA) was established and a detailed

nutrition study (Taghzeh Mardom-e-Yazd-TAMYZ) has been ongoing since the establishment of the biobank. It is anticipated the data collection phase of the nutrition study will be completed by the end of 2017.

Data on a variety of outcomes measures will be collected from the cohort through a combination of in-person surveys, collected every 5 years, and through annual record linkage with the integrated hospital information system (SEPAS) of the area and data from cancer and vital statistics registries of Yazd province.

YaHS provides useful evidence for research in social epidemiology, NCDs epidemiology, spatial epidemiology and genetics epidemiology. Information on accessing YaHS data and other resources can be found at: [<http://yahs.ssu.ac.ir>].

Why was the YaHS cohort set up?

The increasing burden of disease associated with non-communicable diseases (NCDs) is a major public health challenge worldwide. Every year, 38 million people die from NCDs in the world, and 82% (29 million) of these premature deaths attributed to NCDs occur in developing

countries, with an increase in the recent years.^{1,2} In Iran, a very high burden of disease can be attributed to NCDs: 45% of the burden of disease in men and 33% of the burden of disease in women is related to NCDs. Overweight and obesity, hypertension, low physical activity, drug addiction and dyslipidaemia are among the most important risk factors.³

Yazd province, located in the centre of Iran (Figure 1), has experienced rapid economic development and environmental and lifestyle changes over the past two decades. Over the same period of time, the prevalence of known risk factors for NCDs has increased rapidly.

It is estimated that about one-third of Yazd inhabitants are suffering from metabolic syndrome (MetS);⁴ 85.0% of the population (20–74 years old) have at least one and 59% have two relevant risk factors for chronic disease. Hypercholesterolaemia was reported in 12.1% of the population, dyslipidaemia in 58.5%, high blood pressure in 25.6% and cigarette smoking in 13.1%. Overall, 16.4% of the population is obese and 43.3% of men and 62.1% of women have excess weight.⁵ A recent study on prevalence of obesity and overweight among adults aged over 30 years in Yazd showed the prevalence of obesity and overweight were 9.5% and 29.0%, respectively, and the percentage of overweight was greater in women than men and in urban areas compared with rural areas.⁶

A study in 2012 revealed that the prevalence of type 2 diabetes mellitus (DM) has reached to an alarming rate at 16.3% in Yazd,⁷ which is more than double the prevalence of diabetes in Iranian adults aged above 30 years.^{8–12} It is also reported that the age-standardized incidence rate (ASR) of cancer in Yazd province has increased significantly over the period 2004–09, from 85.2/10⁵ to 104.7/10⁵ in 2009, and the rate of change in Yazd province is higher than in other provinces.¹³

Environmental and social risk factors contribute to NCDs and can be prevented. Environmental risk factors of relevance to the Yazd population include air pollution,¹⁴ solar ultraviolet radiation¹⁵ and indoor radon.¹⁶ Cigarette smoking is the most important preventable cause of death worldwide and is prevalent risk factor in the Yazd population: around 31% of adult males smoke cigarettes regularly¹⁷ and 14.2% of pregnant women are passive smokers in Yazd.¹⁸ The overall trend of the motor vehicle accident rate in Iran has reduced over the past few years, but the motor vehicle accident rate in Yazd is still high (37.6/10⁵).¹⁹ Further, riding a motorcycle is a very popular mode of transport in Yazd, but few motorcycle riders use a helmet and multiple trauma in this group is prevalent.²⁰

Immigration has played an important role in the area population growth of Yazd over the three past decades, with an 11-fold increase over this time.²¹ Just over the past 5 years, 57656 people have migrated to Yazd from other parts of Iran and overseas.²² Jobs in the industrial sector and other economic opportunities are among the major reasons for migration to Yazd.

With the ageing population and unhealthy changes in lifestyle and environment, it is expected that the incidence and mortality rate of NCDs will increase in the future. This study provides an opportunity for researchers to investigate the contribution of environmental and lifestyle risk factors on the incidence of NCDs. Although several studies have explored the determinants of prevalent chronic diseases in the Middle East, including Iran,^{23,24} a limited number of large-scale prospective population-based studies have been conducted in the Middle East, e.g. the Golestan Cohort Study.²⁴ Consanguinity (family) marriage ratios, an important factor contributing to increased congenital malformations, is 46% in Yazd,²⁵ which provides a unique opportunity for genetic epidemiology studies.

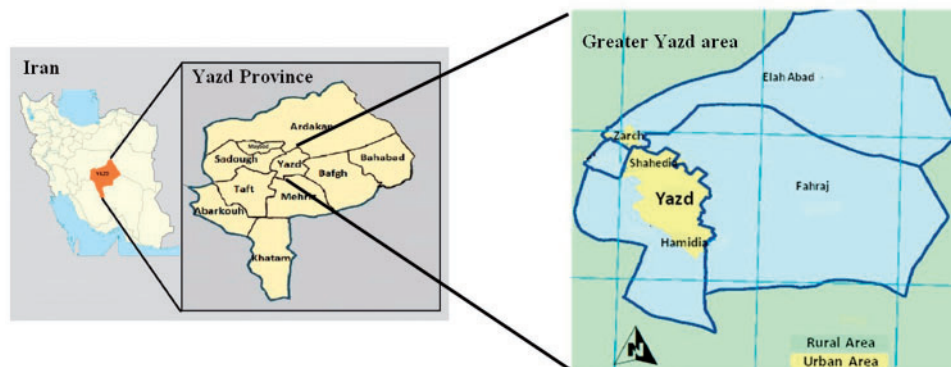


Fig 1. Map with location of Greater Yazd Area in Iran (Area 2397 km²).

Yazd Health Study (YaHS) is a large-scale population-based prospective cohort study commissioned by Shahid Sadoughi University of Medical Sciences in response to the 'National Action Plan for Prevention and Control of Non communicable Diseases and the Related Risk Factors in the Islamic Republic of Iran 2015–2025', which has proposed 13 key targets.²⁶ The recruitment phase of YaHS started in November 2014 and concluded in April 2016. The follow-up surveys will be conducted every 5 years.

This study aims to investigate the changing incidence of a variety of chronic illnesses and associated risk factors in an area with one of the highest rates of chronic illnesses in Iran. The family history of major NCDs is collected to investigate the pedigree of patients in the Yazd population, with over 45% consanguinity marriage. A biobank is established to collect blood and extract DNA samples from the participants for future genetic epidemiology studies. Geocoding of all participants is performed to prepare a database for spatial epidemiology investigation. Ethical approval was obtained from the Ethics Committee of Shahid Sadoughi University of Medical Sciences, No. 17/1/73941. Written informed consent was obtained from all participants.

Who is in the cohort?

Sample region

Yazd province is located in the centre of Iran. According to the latest Iranian National Census (2011), it is populated by 1074428 inhabitants, with the population growing at an average rate of 1.63% from 2006 to 2011. The contribution of this province to Iranian gross domestic product (GDP) is estimated at 1.54% in 2009. A majority of the population lives in the urban area (82.8%). Less than half (42.6%) of the workers are employed in industries. The literacy rate is 87.8% in this province, and there were 94076 students (8.6% of population) studying at universities located in the province in 2015.^{27,28}

Greater Yazd area includes Yazd city, which is the capital of Yazd province, and three annexed cities—Shahediah, Zarch and Hamidia—and surrounding villages (Figure 1). The population of Greater Yazd area is 582682: (49% of the population is women and there are 168458 families, and the population is highly urbanized (94.5% live in urban areas).²² Yazd is the first mud clay city in the world, and is well known for its preserved historic sites and was recently inscribed a world heritage by UNESCO.²⁹ In 2015, 64850 foreign tourists visited Yazd.²⁷ Yazd is the main residence of Zoroastrians, who are the original inhabitants or aboriginal people of the country. Zoroastrians do not marry outside their faith, so they are suitable for genetic epidemiology studies.

Yazd is located in the border of the Loot desert and has an average rainfall of around 60 mm per year.³⁰ with annual average humidity of less than 43%.³¹ Due to its harsh climate, the area under agriculture is very limited and only 10% of the population work in the agriculture sector.²⁷

Sampling strategy

In all, 10000 residents of Yazd city aged 20–70 years were selected using a two-level clustered random sampling method according to WHO STEP guidelines.³² First, 200 clusters were selected randomly according to city post-codes. Second, the interviewers contacted the assigned addressees and, after explanation of the study, arranged a meeting time at their residences. The interviewers then went to the neighbourhood of the first addressee according to the study protocol, to interview 50 participants assigned to each cluster: 25 men and 25 women; five persons in each 10-year age group. On the rare occasions that there was more than one family residing in an address with a unique postal code, the interviewers questioned all eligible residents who consented to participate. Furthermore, anthropometrics and blood pressure measurements were carried out after enrolment and during the interview. To avoid under-representation of certain age groups, e.g. 20–29 years and 60–69 years, men and employed persons, and according to the STEP guideline, each cluster consisted of 10 persons in age groups as follows: 20–29, 30–39, 40–49, 50–59 and 60–69 years. The inclusion criteria were age 20–69 years at the time of interview and informed consent to participate in the study. Those who were guests and not residents of the recruited addresses were excluded.

A total of 100 interviewers attended a 1-day workshop to become familiar with interviewing techniques, the study protocol, the questionnaire, anthropometric measurements, measuring blood pressure and measuring pulse. Ethical considerations in conducting interviews and the correct method of obtaining informed consent were also taught and practised in the workshop. After the workshop, candidates were examined and, if they passed the theory and practice sections, they were registered as eligible interviewers for the YaHS study and their photo ID cards were issued. The process was photographed and published at Instagram[®] under *yazd_health_study*.

Iran has had an integrated medical education and health services system, as capacity building for postgraduate students is an important goal for the system.³³ The YaHS study provided a unique opportunity for volunteer postgraduate students to participate in a community-based study and to use the collected data for their treatise and other research projects. This new approach is particularly helpful where research grants are limited for postgraduate

students.³⁴ The per capita research budget for postgraduate students is around USD 1200, which is not enough for students to complete a well-designed and well-administered study.

To increase the response rate of the study, a city-wide media campaign including banners and radio and TV teasers were prepared. Those who agreed to participate in the study and signed the informed consent forms were interviewed at their place of residence (response rate = 94.9 %). The recruitment phase commenced in November 2014 and finished in April 2016. After finishing the interviews and measurement of anthropometrics and blood pressure, an invitation card to attend Yazd Central Laboratory for blood tests was given to each participant, asking them to attend the laboratory before 9 am and after fasting from 10 pm the previous night. The cards contained a unique barcode identifier in order to minimize errors at the laboratory. Using uniform venojects, 15 ml fresh blood was taken from each participant; 10 ml was stored for the Yazd biobank (Zist Bank-e-Yazd-ZIBA) and 5 ml was used for blood and biochemistry tests using calibrated instruments and biochemistry kits (participation rate 40%). All samples were kept at -4°C , processed within 6 h and stored at -75°C thereafter. At biospecimen collection, information was collected on date and time of sample collection and intake of selected medications over the past 24 h and during the preceding week.

Geocoding of all participants is performed using Garmin GPS device model MAP78S (Garmin International Inc., Olathe, KS, USA) to prepare a database for future spatial epidemiology investigation.

Cohort characteristics

The baseline demographics of the study participants are presented in Table 1. Of the total respondents (9965), 49.7% were men and 90% were from the urban areas; 26.2% had primary or less education; 10.3% of the participants had migrated from within the province and 12.8% from other provinces; 94.5% of had public health insurance; and 2.2% of the study participants were Zoroastrian. Most participants (85%) were married; 68.2% of men and 12.2% of women were employed; 50% of women were housewives; 78.6% of the participants were home-owners; and 78.5% live in a residential with more than 100 m² area.

How is the cohort followed up?

The research team will repeat the survey and measurements every 5 years to obtain longitudinal data on changes in various measured factors. Further, YaHS uses data from

Table 1. Distribution of demographic characteristics of Yazd Health Study participants in 2014

Variable	YaHS cohort total 9965 No. (%)
Age group	
20–29	1963 (19.7)
30–39	2025 (20.3)
40–49	2048 (20.6)
50–59	1967 (19.7)
60–69	1907 (19.1)
Missing	55 (0.6)
Insurance	
Not insured	538 (5.4)
Iran Health Insurance Organization	1395 (14)
Social Security Organization	6981 (70.1)
General health insurance	216 (2.2)
Others	683 (6.9)
Missing	152 (1.5)
Sex	
Male	4920 (49.4)
Female	4988 (50.1)
Missing	57 (0.5)
Education	
Primary school and less	2586 (26)
High school	2801 (28.1)
Diploma and graduate diploma	2931 (29.4)
BSc	1291 (13)
MSc and Doctorate	254 (2.5)
Missing	102 (1)
Employment	
Employed	3916 (39.3)
Unemployed	2040 (20.5)
Housewife	3834 (38.5)
Missing	175 (1.8)
Housing	
Owned	7736 (77.6)
Leased	1737 (17.4)
Others	368 (3.7)
Missing	124 (1.2)
Floor area of residence	
Less than 100 m ²	2013 (21.1)
100–200 m ²	5283 (53)
More than 200 m ²	2400 (24.1)
Missing	179 (1.8)
Region of residence	
Urban	8966 (90)
Rural	996 (10)
Missing	3(0)
Marriage status	
Married	8427 (84.6)
Single	1054 (10.6)
Widowed	380 (3.8)
Divorced	55 (0.6)
Missing	49 (0.5)
Migration status	
Native	7440 (74.7)
From within the province	1022 (10.3)
From other provinces	1265 (12.7)
From overseas	215 (2.2)
Missing	23 (0.2)

population-based registries and linked outcome data from the aggregated hospital information system (Samanah Electronici PARvandeH Salamat-SEPAS) which covers 100% of public hospitals and the majority of private hospitals in Yazd province. Deaths, cancer incidence, surgeries, ischaemic heart disease, stroke and other outcomes will be extracted from SEPAS using the National Identifier number of each participant to link data. National ID is a unique identifier of each Iranian citizen which has been widely used in almost all national databases. This will provide an opportunity for data linkage studies in the future. New variables may be added in the future waves of the study, according to the recommendations of health experts.

What has been measured?

A validated questionnaire including 300 questions plus anthropometrics, blood pressure and vital signs was filled in by trained interviewers and includes the following sections; a) demographics, b) physical activity, c) sleep quality and quantity, d) mental health, e) past medical history of chronic disease and surgical operations, f) dental health, g) history of accidents, h) dietary habits, i) occupation and social life, j) traditional medicine, k) smoking habit and drug addiction, l) women's health and m) quality of life. Each interview, including measurements, lasts for 60–90 min. A panel

of experts suggested and approved the questions. Face validity was ensured by the panel and the questionnaire was piloted on 50 participants. Cronbach's alpha was 0.89%, and therefore the questionnaire was considered reliable. Various anthropometrics, blood pressure and pulse were measured and recorded in three sessions before and during the interviews. Table 2 summarizes the variables collected in the questionnaire.

Anthropometric measurements

Body weight was measured using an Omron BF511 portable digital scale and body analyser (Omron Inc. Nagoya, Japan) with accuracy of 0.1 kg, while standing on the middle of the scale, without assistance and with minimum clothing. Body fat and muscle percentage was measured using the same device, according to instructions. All anthropometric measurements were performed before commencing the interview, again after having completed one-third of the questionnaire and for a final time after completing two-thirds of the questions in the questionnaire—according to the study protocol.

Height was measured in a standing position using a tapemeasure on a straight wall to the nearest centimetre. To measure height, participants were barefoot and their heads placed in the Frankfurt position, shoulder blades, buttocks and heels were touching the wall, to which the

Table 2. Tools used and data collected in the first wave of Yazd Health Study 2013–14

Dimension	By	List of data available and the instruments used
Demographics	Interview (27 questions)	Age, sex, education, number of children, occupation, area of residence (m ²), type of insurance
Medical history	Interview (58 questions)	History of chronic disease (cardiovascular disease, diabetes mellitus, cancers, depression, rheumatic disease)
History of trauma	Interview (8 questions)	Motor vehicle accidents, falls, drownings, poisonings, burns, suicidal attempts
Dental health	Interview (7 questions)	Toothbrushing, flossing, filled and missing teeth
Family history of chronic disease	Interview (22 questions)	Cardiovascular disease, diabetes mellitus, cancers, depression, rheumatic disease
Health care use	Interview (38 questions)	Health service use, surgical operations, hospital admissions and general practitioner, specialist and sub-specialist visits over the past year
Traditional medicine	Interview (12 questions)	Traditional medicine use, herbal medicine
Mental health	Interview (21 questions)	Depression, anxiety stress scales-21 (DASS 21) ³⁵ and diagnosis of depression by a doctor
Social well-being	Interview (23 questions)	Pittsburgh sleep quality and quantity (PSQI-P), ³⁶ life quality (SF8), ³⁷ social life
Women's health	Interview (27 questions)	Marriage, obstetric and gynaecological history
Health behaviours	Interview (55 questions)	Smoking habits and addiction, physical activity (IPAQ), ³⁸ dietary habits
Anthropometrics and vital signs	Objective measurements	Height, weight, waist circumference, hip circumference, neck circumference, body mass index, % body fat, % body muscle, visceral fat score, blood pressure (three measurements), pulse (three measurements)
Blood count and serum biochemical variables	Blood sample	Fasting blood glucose, serum cholesterol, LDL, HDL, triglycerides, urea, uric acid, creatinine, complete blood cell counts, ESR and thyroid T3, T4, TSH for a random sub-sample
Biobank	Blood sample	DNA, buffy coat, serum, and red cells

tape was fixed. The body composition monitors were regularly calibrated by a Tanita body scan (Model 494, Tanita Corp., Tokyo, Japan). Waist circumference (WC) was recorded to the nearest 0.5 cm using non-stretch tape placed midway between iliac crest and lowest rib while participants were in the standing position.³² Hip circumference was also measured over the largest part of the buttocks, with an accuracy of 0.5 cm. The neck circumference was measured using a tapemeasure around the base of the neck below the thyroid, holding it slightly loose and not restrictive on the neck. Body mass index (BMI) (kg/m^2) was calculated using weight and height measurements according to the following formula: weight (kg)/height squared (m^2).

Blood pressure measurement

Blood pressure was measured in a sitting position after two-thirds of the interview questions were completed, so the interviewees had been in a rested state for at least 40 min at this time. Pulse and blood pressure measurements were repeated three times with 5 min between each measurement, using Reichter electronic sphygmomanometers (Model N-Champion, Reister GMBH, Germany) which were calibrated regularly. The means of the second and third measurements were recorded as blood pressure and pulse accordingly.

Blood sampling and laboratory assessments

Laboratory measurements consisted of fasting blood glucose (mg/dl), triglycerides, low-density lipoprotein (LDL), high-density lipoprotein (HDL), serum cholesterol, urea, uric acid, creatinine, complete and differential blood count and also erythrocyte sedimentation rate (ESR). All measurements were according to a standard laboratory protocol using Pars Azmoon kits and calibrated Ciba Corning (Ciba Corp., Basle, Switzerland) auto-analysers.

Data collected in the Sub-study

Dietary foods and supplements have been assessed in the sub-study, called Yazd Nutrition Survey (YNS) and locally known as TAMYZ in Persian (TAghezeh-e-Mardome YaZd). This component of YaHS involved administration of a food frequency questionnaire (FFQ) consisting of 178 food items and 551 questions. All participants of YaHS were included in TAMIZ which started in December 2015. To date, over 7000 participants have been interviewed. This sub-study will provide a good source of data to explore diet-disease associations through linking YNS and YaHS data. Figure 2 demonstrates a flowchart of YaHS data collection. All interviewers were trained in how to ask questions and complete the FFQ. The FFQ used in YNS was a modified version of a previously validated 168-item

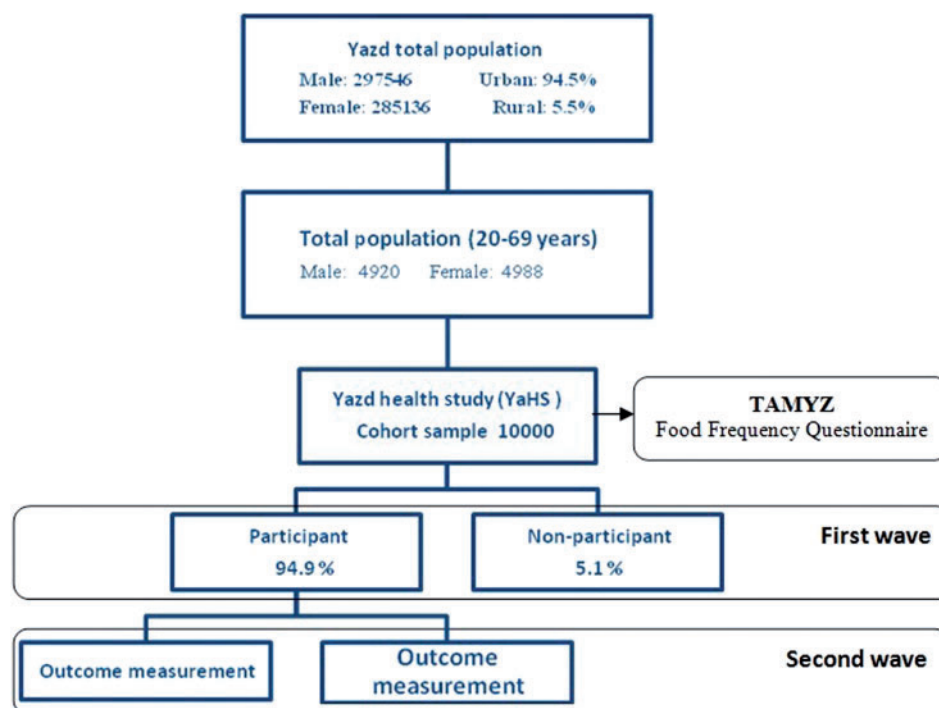


Fig 2. Flowchart of the data collection process of Yazd Health Study.

food frequency questionnaire³⁹ used for Tehran Lipid and Glucose Study (TLGS).⁴⁰ An additional 10 questions relating to consumption of Yazd-specific food items frequently consumed in the region were added to the original 168-item FFQ, resulting in a 178-item FFQ. Further, the 168-item FFQ used in TLGS was designed to be open-ended in its original form; however, we modified the questionnaire to a multiple choice one in YNS. Participants answered two questions about each food item: (i) the frequency of food consumption (number of times per month, week or day the food was eaten, in the past year); and (ii) amount of food taken each time.

To increase the precision and accuracy of estimates, we gave the portion size of foods as a unit using a photo book for all participants to reference. Participants were asked to report frequency of intake of all foods based on 10 multiple-choice frequency response categories varying from 'never or less than once a month' to '10 or more times per day'. The amount of food eaten at each intake was determined using questions with five predefined answer categories. The choices were different, according to each food item. Participants were also interviewed using a separate multiple-choice questionnaire about the frequency of the following supplements: fish oil (or omega-3), calcium, vitamin D, folic acid, iron and multivitamin-mineral supplements.

Data management

The answers were recorded on optical mark reading (OMR) answer sheets specially designed and printed for the study. The data reading step was completed twice to minimize any potential errors. The data entry phase occurred after a bunch of 500 answer sheets was scanned. Fieldwork supervision was done by the principal investigator (Mirzaei M.) and an independent representative of the research council of the university. Data entry and management was done under supervision of an information technology expert and a biostatistician. Data from death and cancer registries as well as SEPAS system were linked to the YaHS database after finishing the recruitment phase with a 6-month wash-out period.

Study protocol and ethics approval

The study protocol, patient information sheet and consent forms were approved by the ethics committee of Shahid Sadoughi University of Medical Sciences, and several large studies including the Iranian Mental Health Study adopted their protocol from YaHS study.⁴¹

What has been found?

Key findings and publications

At baseline, 10.4%, 8.0%, 1.8% and 1.8% of YaHS participants reported a history of hypertension, diabetes, asthma and common cancers, respectively. The estimated age-standardized systolic and diastolic blood pressures were 13.9% and 15.9%, respectively. Overall 13.4% of adults in this population were estimated to be systolic or diastolic hypertensive. The prevalence of overweight (BMI = 25–29.9 kg/m²) was 35.9% and of obesity (BMI ≥ 30 kg/m²) was 23.0%.

Consumption of fruit and vegetables was less than two serving per day in 52.3% and 77.3% of participants, respectively; 24.6% of the participants consumed red meat four or more times per week, and 12.6% had more than two servings of soft drink per week. Eating less than one serving of fish per week was reported by 72.4% of the participants. Sugar was served more than four times per day by 37.4%.

A total of 43% of participants had a low level of physical activity (men 36.4% and women 50.3%). The overall age-standardized prevalence of smoking was 9.7% (18.1% in men and 1.6% in women). Hooka smoking was reported by 12% and opium use by 4.4% of the participants.

Motor vehicle accidents were reported by 4.6% of the participants, also falls (0.76%), burns (0.76%) and poisonings (1.25%). Only 23% of the population reported using a seat belt while on public transport, but 84.1% reported using a seat belt while in a private vehicle. [Table 3](#) demonstrates baseline characteristics of the participants.

What are the main strengths and weaknesses?

Strengths

Strengths of YaHS are as follows:

- the first large, population-based prospective study with collection of a broad range of health-related data points measured in a representative sample.
- building capacity for training of researchers;
- applying long-term bio-banking;
- follow-up and longitudinal analysis for etiological hypotheses;
- facilitating the running of 'cohort multiple randomized controlled trials';
- link with the other health registry;
- collaboration between academics and managers of health system;
- urban and rural coverage;
- and representative Zoroastrian samples

Table 3. Selected age-standardized baseline characteristics of Yazd Health Study participants 2014

Domain	Variable	Men (%)	Women (%)	P-value
Lifestyle (health behaviours and dietary habits)	Low level of physical activity	36.4	50.3	0.000 ^a
	Current cigarette smoking	18.1	1.6	< 0.0001 ^a
	Hooka smoking	18.6	5.4	0.000 ^a
	Drug addiction	6.2	2.8	0.000 ^a
	Eating less than two servings of fruits per day	52.4	52.3	0.397 ^a
	Eating less than two servings of vegetables per day	78.5	76.1	0.091 ^a
	More than two servings of soft drink per week	15.8	9.4	< 0.0001 ^a
	Eating less than one serving of fish per week	72.1	72.6	0.053 ^a
	More than four servings of red meat per week	23.3	26	0.049 ^a
	Regularly taking fried foods	31	28.3	0.001 ^a
	More than four servings of sugar per day	43	31.9	< 0.0001 ^a
	Seat belt use (public transport)	25.2	20.6	< 0.0001 ^a
	Seat belt use (private car)	86.4	81.7	< 0.0001 ^a
Mental health (moderate to severe)	No toothbrushing	23.7	14.5	< 0.0001 ^a
	Depression	14.3	21.7	< 0.0001 ^a
	Anxiety	19.2	31.4	< 0.0001 ^a
Quality of life	Stress	18.2	27.2	< 0.0001 ^a
	Very good and good	95.5	90.5	0.1 ^a
Anthropometrics	BMI (mean ± SD)	26.3 ± 4.6	28.07 ± 5.5	0.01 ^b
	Overweight (BMI = 25–30 kg/m ²)	38	34	< 0.0001 ^a
	Obese (BMI ≥ 30 kg/m ²)	17.9	27.8	
Physical examination	Systolic blood pressure (mean ± SD)	128.7 ± 17.6	124.5 ± 19	< 0.0001 ^b
	Diastolic blood pressure (mean ± SD)	81.9 ± 12.6	78.5 ± 12	< 0.0001 ^b
Laboratory findings	Total cholesterol (mean ± SD)	190.7 ± 42.3	197 ± 43.2	< 0.0001 ^b
	Fasting blood sugar (mean ± SD)	106.5 ± 39.3	107 ± 36.2	0.701 ^b
Self-reported disease (diagnosed by physicians)	Hypertension	8.9	11.9	< 0.0001 ^a
	Diabetes mellitus (20–69 years)	7	8.94	< 0.0001 ^a
	Diabetes mellitus (30–69 years)	10.48	13.15	
	Diabetes mellitus (40–69 years)	15.96	20.4	
	Asthma	1.6	1.9	0.07 ^a
	Depression	3.2	6.8	< 0.0001 ^a
Accidents (past 1 year)	Common cancers	0.76	0.85	0.840 ^a
	Motor vehicle accidents	6.6	2.5	< 0.0001 ^a
	Falls	1	0.5	0.01 ^a
	Burns	0.8	0.6	0.46 ^a
	Poisonings	1.3	1.1	0.252 ^a

^aChi-square test; ^bT-test.

Weaknesses

Weaknesses of YaHS are as follows:

- lack of a systematic update of exposure information;
- follow-up cost, so funds may be needed for follow-up because it is impossible that data collection be done by the health system routinely;
- the population of the study was adult; the study design does not allow us to investigate cross-sectional and then longitudinal differences from childhood to adulthood or from adulthood to older age;
- biochemistry and blood tests were limited to 40% of participants; however, no significant differences have been

observed between those who gave the samples and those who did not, in terms of socioeconomic status;

- limited information about pedigree data;
- the first wave data were collected over 18 months, slightly more than the 15-month original time frame;
- self-reported data were collected; however, outcomes will be extracted from an aggregated electronic database;
- due to local sensitivity, data on alcohol use and sexual behaviours were not collected.

Conclusion

In conclusion, YaHS has provided useful and reliable quantitative data for use in social epidemiology, spatial

epidemiology, NCDs epidemiology, genetics epidemiology and health services research. We reported the profile, baseline findings and progress of YaHS under the Yazd Health Study project, which is a general-purpose epidemiological study. An additional survey is planned for 2018–19. We are certain to obtain additional useful data in the 2018–19 survey.

Can I get hold of the data? Where can I find out more?

The data collected by Yazd Health Study are not open access but can be shared under conditions of collaboration and endowment. Collaborative research projects are encouraged, and enquiries and queries can be submitted to the first author at [mmirzaei@ssu.ac.ir], noting that there is a specific protocol for applications related to data sharing. Collaborative research projects will be discussed informally in the first instance, with the final decision on data sharing decided by the YaHS steering committee which will evaluate all proposals related to data sharing. For further information, please visit YaHS website at [www.yahs.ir / yahs.ssu.ac.ir]. All YaHS publications are available on its Google Scholar account at: [http://scholar.google.com/citations?user = BAxYGM4AAAAJ&hl = en].

Profile in a nutshell

- Yazd Health Study (YaHS) is a large-scale population-based prospective cohort study with 10000 registered 20–70-year-old cases in Yazd Greater Area located in central Iran, with 94% response. Yazd has experienced rapid environmental and lifestyle changes over the past two decades.
- YaHS offers greater focus for research surrounding lifestyle factors including unhealthy diet, physical inactivity, drug addiction and tobacco smoking, which play an important role in non-communicable disease development and mortality. YaHS makes possible genetic epidemiology studies on gene-environment interactions and familial aggregations of various chronic diseases in the Middle East.
- A variety of outcomes measures will be collected from the cohort through a combination of in-person surveys, collected every 5 years, and annual record linkage with the integrated hospital information system and cancer and vital statistics registries.
- The data collected can be shared under conditions of collaboration and endowment. YaHS provides a unique opportunity for postgraduate students to use for their treatise and other research projects.

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