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Bushehr Elderly Health (BEH) Programme, phase I (cardiovascular system)

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This study is being carried out at The Persian Gulf Tropical Medicine Research Centre, which is affiliated with Bushehr University of Medical Sciences, in Bushehr, Iran.

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ABSTRACT

Purpose: The main objective of the Bushehr Elderly Health Programme, in its first phase, is to investigate the prevalence of cardiovascular risk factors and their association with major adverse cardiovascular events.

Participants: Between March 2013 and October 2014, a total of 3000 men and women aged ≥60 years, residing in Bushehr, Iran, participated in this prospective cohort study (participation rate=90.2%).

Findings to date: Baseline data on risk factors, including demographic and socioeconomic status, smoking and medical history, were collected through a modified WHO MONICA questionnaire. Vital signs and anthropometric measures, including systolic and diastolic blood pressure, weight, height, and waist and hip circumference, were also measured. 12-lead electrocardiography and echocardiography were conducted on all participants, and total of 10 cc venous blood was taken, and sera was separated and stored at –80°C for possible future use. Preliminary data analyses showed a noticeably higher prevalence of risk factors among older women compared to that in men.

Future plans: Risk factor assessments will be repeated every 5 years, and the participants will be followed during the study to measure the occurrence of major adverse cardiac events. Moreover, the second phase, which includes investigation of bone health and cognition in the elderly, was started in September 2015. Data are available at the Persian Gulf Biomedical Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran, for any collaboration.

Strengths and limitations of this study

- This is the first large sample prospective cohort study in Iran focusing on cardiovascular risk factors in the elderly as a growing population.
- The long-term follow-up in this study will allow for the assessment of many relevant outcomes.
- The participation rate in this study was high; however, outcome ascertainment may be incomplete because of incomplete death and MACE registries.

INTRODUCTION

The world's population is ageing rapidly. The proportion of those over the age of 60 years will double, from about 11% to 22%, between 2000 and 2050. The absolute number of people aged 60 years and over is expected to increase from 605 million to 2 billion over the same period.[1] According to the latest Iranian Census Data, about 8.2% of the population was over 60 years of age in 2011.[2] By the year 2020, the elderly population (over 60 years of age) is estimated to reach 10%.

Coronary heart disease (CHD) is one of the leading causes of disease burden in developing countries. In other words, three-fourths of global deaths due to CHD occurred in low-income and middle-income countries.[3] In the year 2003, there were 21 572 Disability Adjusted Lost Years (DALYs) due to all diseases and injuries per 100 000 Iranian people of all ages and both sexes. From this total number of DALYs, 58% were due to non-communicable diseases; ischaemic heart disease was the fourth cause of DALYs in males and the first cause of DALYs in females.[4]

There is a need for effective public health action on cardiovascular disease (CVD) prevention, especially in low-income and middle-income countries, and for assessments of the cost-effectiveness of feasible

interventions.[5] In addition, there is a need to try to balance the fight against the existing burden of infectious diseases with the growing epidemic of chronic diseases such as heart disease and diabetes.[6] The high costs of direct medical care and the indirect costs of CVD, according to the American Heart Association, were approaching $450 billion annually in 2010 and were projected to rise to over $1 trillion annually by 2030.[7] Prevention of premature deaths due to non-communicable diseases and the reduction of related healthcare costs should be the main goals of health policy. Improving the detection and treatment of non-communicable diseases, and preventing complications and catastrophic events from occurring, should be the major goals of clinical medicine.[8] Trends in CVD risk factors and blood glucose will result in substantial CVD burden in developing countries and economies in transition in the near future. Periodic and consistent monitoring of trends and the effects of these risk factors on disease burden is needed for prioritising prevention programmes.[9]

In recent decades, cohort studies have played a major role in investigating the incidence and causes of common health outcomes. As major adverse cardiovascular events (MACE) are quite common in old age, there are many cohort studies investigating these outcomes. A vast majority of these cohort studies are being conducted in developed countries.[10–20] However, the number of such prospective studies in the developing world is also rising.[21–25] In Iran, there are a few large prospective studies being conducted in various fields. Golestan's cohort study, a prospective study of oesophageal cancer in northern Iran,[26] the Tehran Lipid and Glucose Study (TLGS)[27] and the Shahrood Eye Cohort Study (ShECS),[28] are among these studies. The Amirkola Health and Ageing Project (AHAP) is the only large sample prospective cohort study in Iran, specifically aimed at investigating falling, bone fragility and fractures, cognitive impairment and dementia, poor mobility and functional dependence in the elderly.[29]

This paper describes the rationale for, design and preliminary results of the Bushehr Elderly Health (BEH) Programme, a population-based prospective cohort study conducted in Bushehr, a southern province of Iran. The main objective of this study, in its first phase, is to investigate the prevalence of cardiovascular risk factors and their association to MACE.

COHORT DESCRIPTION

The target population of this prospective cohort study was all men and women aged 60 years and over residing in the city of Bushehr. Based on the information available from the Bushehr District Health Centre, this population was estimated to be around 10 000. Box 1 shows eligibility criteria for participation in the study.

The participants in the BEH Programme were selected through a multistage, stratified cluster random sampling method. Based on the classifications made by the municipality, as shown in figure 1, we stratified Bushehr to 75 strata. Numbers were assigned to the blocks (as clusters) of each stratum and then randomly sorted. We invited all eligible older people residing in each block selected to participate and then moved to the next block, repeating the invitation process, until we gained the sample

Box 1 List of inclusion and exclusion criteria of participants

Inclusion criteria
- Age more than or equal to 60 years
- Both sexes
- Residency in Bushehr port since at least 1 year prior to the recruitment
- No plan to leave Bushehr for the following 2 years after the recruitment
- Adequate physical and mental ability to participate in the evaluation programme
- Signing of written informed consent

Exclusion criteria
- No residence in Bushehr
- Unwilling to participate in the study

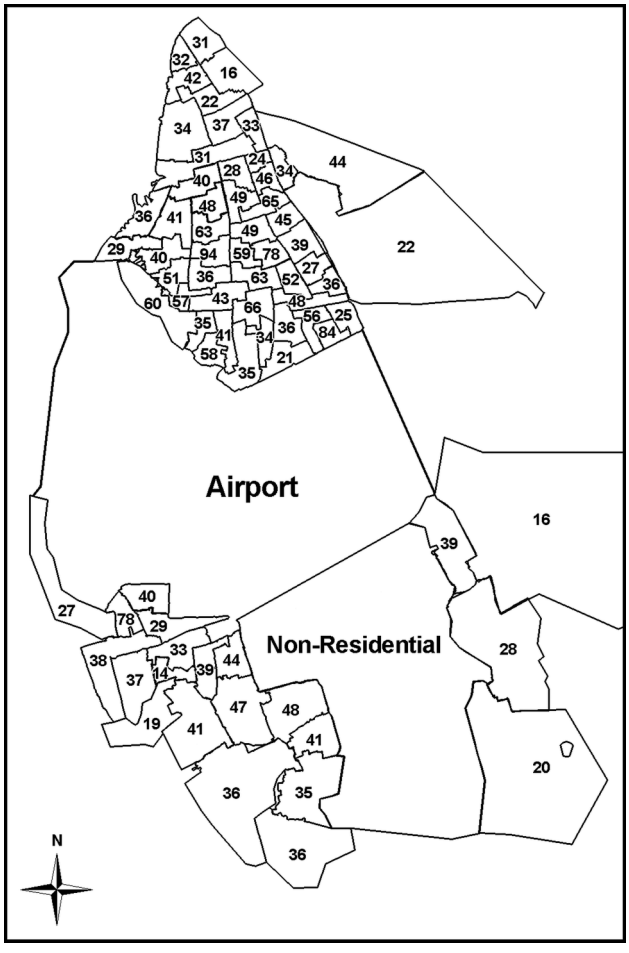

Figure 1 Map of Bushehr and distribution of participants in the strata.

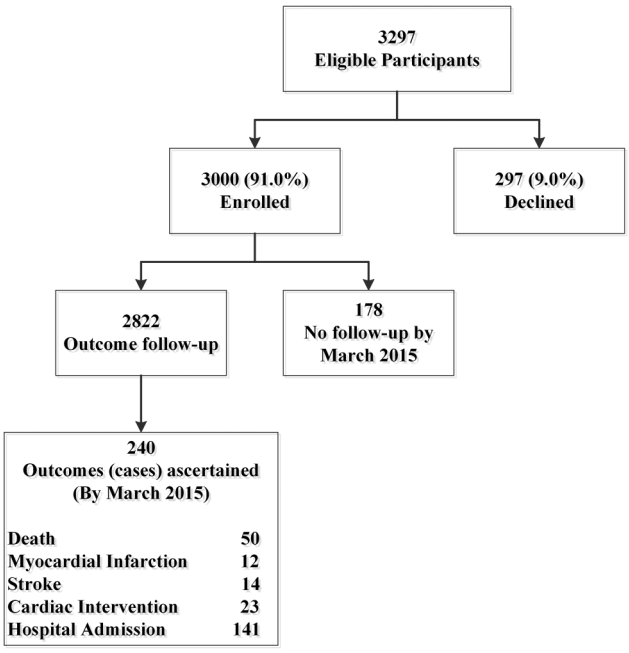

Figure 2 Flow chart of enrolments.

required for that stratum. Sample sizes for strata were determined proportional to the number of households residing in each stratum. As shown in figure 2, between March 2013 and October 2014, from among 3297 older people aged 60 years and over who were invited, a total of 3000 participated in this study (participation rate: 91.0%). Non-respondents were found among all strata, and there was no obvious pattern indicating selection bias. Baseline characteristics of participants are shown in table 1.

The main follow-up assessments of risk factors will be carried out every 5 years for three consecutive periods (a total of 15 years of follow-up), in which all assessments will be repeated with comparable methods and modalities.

In addition, interim assessments will be made to ascertain outcomes and risk factor changes.

All participants will be contacted by a trained nurse once annually, and a checklist will be completed to check if any outcome of interest (major adverse cardiac events) has occurred during the 12 months prior to the assessment. A form has also been distributed to the participants to self-report as soon as possible after the occurrence of any of the targeted outcomes. Focal points in the two main hospitals in Bushehr (Shohadaye-Khalij-e-Fars and Salman-e-Farsi hospitals) are responsible for monthly checking of the hospital information system (HIS) and reporting admissions. If any outcome is reported, a general physician will review the inpatient/outpatient medical records and documents, and detailed information will be entered into the special outcome forms. Our database will be cross-linked with the death registry system database, available via the public health system. The death registry system receives information

Table 1 Baseline sociodemographic characteristics of participants in Bushehr Elderly Health Programme

Characteristics (N (%))	Men (1455 (48.5))	Women (1545 (51.5))
Age group (years)		
≤64	616 (42.3)	674 (43.6)
65–69	317 (21.8)	378 (24.5)
70–74	230 (15.8)	200 (12.9)
75–79	166 (11.4)	181 (11.7)
≥80	126 (8.7)	112 (7.2)
Marital status		
Single	5 (0.3)	20 (1.3)
Married	1378 (94.7)	884 (57.2
Widowed	68 (4.7)	619 (40.1)
Divorced	4 (0.3)	22 (1.4)
Current occupation		
Employed	133 (9.1)	23 (1.5)
Retired	1195 (82.1)	126 (8.2)
Unemployed*	127 (8.7)	1396 (90.4)
Education		
No education	315 (21.6)	777 (50.3)
Primary school	400 (27.5)	459 (29.7)
Secondary School	276 (19.0)	151 (9.8)
High school	287 (19.7)	125 (8.1)
University	177 (12.2)	33 (2.1)

*Homemaker for female.

from hospitals, forensic medicine departments, cemeteries and vital events records offices, and duplicate records are deleted. The International Classification of Diseases (ICD) 10, WHO online version, is used to classify causes of death. A person's national identification number is used as a unique identifier to cross-link databases. In the case of a death report but no reliable death certificate, a verbal autopsy will be performed to determine cause of death. Box 2 presents list of outcomes ascertained in the present study.

Baseline examination

A modified WHO MONICA questionnaire[30] translated into Persian was used as the core questionnaire to gather baseline information on demographic and socioeconomic variables and risk factors. Table 2 presents the components of the core questionnaire.

Phlebotomy and laboratory analyses

Participants were asked to provide a venous blood sample for laboratory tests. A total of 10 cc of whole

Box 2 List of outcomes, Bushehr Elderly Health Programme study

- Death
- Myocardial infarction
- Stroke
- Cardiac interventions
- Hospital admission

Table 2 Section and topics of the Core Questionnaire in the Bushehr Elderly Health Programme study

Type of data	Components
Demographic	▶ Personal information (name, nickname, surname) ▶ National identification number ▶ Age and sex ▶ Marital status ▶ Contact information
Socioeconomic	▶ Employment status ▶ Education level ▶ Insurance ▶ Family income ▶ Family assets ▶ Residence status
Cardiovascular risk factors and medical history	▶ Smoking status and history ▶ Physical activity ▶ Menstrual and menopause history ▶ Blood pressure history ▶ Diabetes history ▶ Lipid profile history ▶ Ischaemia and myocardial infarction history ▶ Weakness, impaired sensation and stroke history ▶ Rose and claudication history ▶ Heart failure history
Drug history	▶ Administered by physician ▶ Over the counter drugs ▶ Supplements

blood was taken by a trained nurse after 8–12 h of fasting. Table 3 presents laboratory tests performed at baseline and their methods of measurement. Sera were also separated and stored at –80°C for possible future use.

Clinical assessment

A comprehensive physical examination, including vital signs, weight and height measurements, and waist and hip circumference, were taken at baseline. Twelve-lead electrocardiography, performed by a trained nurse, and echocardiography, carried out by a cardiologist, were conducted for all participants (see table 3).

FINDINGS TO DATE

Baseline data are being analysed, and preliminary findings are presented in table 4.[31] The prevalence of cardiovascular risk factors was remarkably higher among older women compared to that in men. Smoking behaviour was different among older men and women. Older women did not smoke cigarettes as often as men; however, the prevalence of hookah smoking was higher in women. One-third of older women were obese, which was two times more than the prevalence of obesity among men. Metabolic syndrome was also about two times more prevalent among older women.

STRENGTHS AND LIMITATIONS

This is the first large sample prospective cohort study in Iran focusing on cardiovascular risk factors in the elderly as a growing population. The long-term follow-up in this study will allow for the assessment of many relevant outcomes. The participation rate in this study was high; however, outcome ascertainment may be incomplete because of incomplete death and MACE registries.

Table 3 Baseline physical examinations and laboratory tests, Bushehr Elderly Health Programme study

Item	Method of measurement
Physical examination	
Arterial blood pressure	Manually by standard mercury sphygmomanometer in sitting position
Weight in kg	Stadiometer; heavy outer garments will be removed
Height in cm	Stadiometer; shoes will be removed
Waist circumference in cm	At the midway level between the costal margins and the iliac crests
Hip circumference in cm	At the level of the greater trochanters
Laboratory tests	
CBC	Automated haematology analyser
Fasting blood sugar	enzymatic (glucose oxidase) colourimetric method using a commercial kit (Pars Azmun Inc, Tehran, Iran)
Lipid profile (total cholesterol, LDL-C, HDL-C, triglyceride)	Serum total cholesterol and HDL cholesterol will be measured using a cholesterol oxidase phenol aminoantipyrine and triglycerides using a glycerol-3-phosphate oxidase phenol aminoantipyrine enzymatic method. Serum LDL cholesterol will be calculated using the Friedwald formula; LDL cholesterol will not be calculated when triglycerides concentration is >400 mg/dL
Procedures	
Electrocardiography	12-lead, by a trained nurse
Echocardiography	Using M-Turbo Ultrasound System, Manufactured by SonoSite, Inc, by a cardiologist

CBC, complete blood count; HDL, high-density lipoprotein; LDL, low-density lipoprotein.

Table 4 Frequency and age-adjusted proportions of risk factors in participants of the Bushehr Elderly Health Programme

Risk factor (N (%))	Men (1455 (48.5))	Women (1545 (51.5))
Smoking		
Hookah		
Non-smoker	1143 (78.8)	951 (61.4)
Current smoker	110 (7.5)	267 (17.2)
Intermittent smoker	4 (0.3)	7 (0.5)
Former smoker	198 (13.4)	320 (20.9)
Cigarette		
Non-smoker	1023 (70.3)	1522 (98.5)
Current smoker	198 (13.7)	14 (0.9)
Intermittent smoker	1 (0.1)	0 (0.0)
Former smoker	233 (16.0)	9 (0.6)
Hypertension	820 (56.1)	1054 (68.4)
Diabetes mellitus	390 (27.0)	506 (32.6)
Hypercholesterolaemia	886 (61.0)	1034 (66.9)
BMI*		
<25	615 (42.6)	414 (27.8)
25–29.9	612 (42.7)	591 (39.0)
≥30	211 (14.7)	511 (33.2)
Metabolic syndrome†	403 (28.5)	826 (53.3)

*Forty-six missing.
†Based on the NCEP ATP III.
‡Percentages are age-adjusted.
BMI, body mass index.

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Contributors AO drafted the manuscript, participated in study design and conduction, performed data analysis and interpretation. IN conceived the study, helped draft the manuscript, participated in the study design and conduction, and data analysis and interpretation. BL participated in the study design and conduction and reviewed the manuscript. RH helped draft the manuscript, participated in the study design and conduction, and data analysis and interpretation. HD, KV, NM, GH, AR and MH participated in the study design and reviewed the manuscript. MP, AA, RN, HS and MB participated in the study design and data collection, and reviewed the manuscript. MR, GS, FS, AN and RT participated in questionnaire development, study design and staff training, and reviewed the manuscript. HAM, MRA, SF, SD and DM participated in data collection and reviewed the manuscript.

Competing interests None declared.

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Ethics approval This study is being conducted in agreement with the Declaration of Helsinki and in accordance with Iranian national guidelines for ethics in research. The protocol of the study was approved by the regional research ethics committee of Bushehr University of Medical Sciences on 23 September 2013, Reference number: B-91–14-2. All participants were asked to sign a written informed consent, which was approved by the research ethics committee. The participants are able to withdraw from the study at any time without any explanation. Data collected are stored in a re-identifiable form by national ID code. The results will be presented at national and international meetings and published in a peer-reviewed journal. We aim to translate the key findings to an easily understandable format for local residents and to present them through local media. Relevant findings will also be presented as policy briefs to national and local health policy makers.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement A large amount of data have been collected. Access to the data is available for interested researchers from corresponding author IN (inabipour@gmail.com) or from AO (a.ostovar@bpums.ac.ir).

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