

COHORT PROFILE

Cohort Profile: The Amirkola Health and Ageing Project (AHAP)

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This is the first comprehensive cohort study of the health of older people ever conducted in Iran. The aim of this project is to investigate the health status of older people in Amirkola in the northern part of Iran, near the Caspian Sea. The Amirkola Health and Ageing Project (AHAP) is mainly concerned with geriatric medical problems, such as falling, bone fragility and fractures, cognitive impairment and dementia, poor mobility and functional dependence. It is planned that all participants will be re-examined after 2 years. Data are collected via questionnaire, examinations and venepuncture. AHAP started in April 2011 and 1616 participants had been seen by 18 July 2012, the end of the baseline stage of this study. The participation rate was 72.3%. The prevalence of self-reported hypertension (41.2%) and diabetes mellitus (23.3%) are high. Only 14.4% of older people considered their health as excellent or good in comparison with others at this age. The prevalence of osteoporosis (T score ≤ -2.5) was 57.4% in women and 16.1% in men, and 38.2 % of older people were vitamin D deficient (<20 ng/ml). Researchers interested in using the information are invited to contact the principal investigator Seyed Reza Hosseini (hosseinim46@yahoo.com).

Keywords Health, ageing, older people, Iran

Why was the cohort set up?

With declining fertility rates and increases in life expectancy, the population of the world is ageing at an unprecedented rate.¹ Ageing is a challenge that affects both developed and developing countries. The proportion of older people in Iran is increasing due to a decrease in birth rate and generally improved health due to better access to health services. The proportion of people aged 60 years or older was about 7.3% in 2005 and it is predicted to increase to 11.6% in 2025 and 30.8% by 2050.² Parallel to this situation, the frequency of non-communicable diseases such as diabetes mellitus, coronary artery disease, cancer, lung diseases, cerebrovascular diseases and osteoporosis is also increasing.³ Many of these chronic diseases are associated with risk factors such as smoking, hypertension, high cholesterol, obesity and physical inactivity. Primary prevention to reduce the prevalence of these risk factors can lead to a reduction in health care costs.³ There is little information about health conditions among older people in Iran. Projects that have been done have been small and/or narrowly focused and there have been no comprehensive studies to date.⁴⁻⁹

The aim of our project is to investigate the health status of older people in Amirkola in the northern part of Iran, near the Caspian Sea. All people in Amirkola aged 60 years and over were invited to participate in this study. This project is funded by the Vice-Chancellery of Research and Technology, Babol University of Medical Sciences. The baseline stage of this project was done in 2011 and 2012, and follow-up surveys will be done every 2 years.

The Amirkola Health and Ageing Project (AHAP) is mainly concerned with geriatric medical problems such as falling, bone fragility and fractures, cognitive impairment and dementia, poor mobility and functional dependence. Follow-up will enable us to detect risk factors for these conditions. AHAP also includes a broad range of biochemical and hormonal tests measured at baseline and follow-up. Repeated measurements will help identify their role in the development of chronic diseases in older people. The baseline data will be used to describe the prevalence of osteoporosis, dementia, depression and functional dependence. Follow-up surveys will be used to describe the incidence of these disorders.

Who is in the AHAP observational cohort?

The AHAP involves people aged 60 years and above who live in Amirkola. Amirkola is a small town in northern Iran near the Caspian Sea. The total population of Amirkola is 26 232. It is located about 3 km from the city of Babol, where the study leaders are based. There are two health care centres in Amirkola and the names of all elderly people in the town are

registered and stored at these health care centres. There were 2234 people aged 60 years or older living in the 34 districts in Amirkola when this study began, 1158 men and 1076 women. People were informed about the study in talks in mosques and also via posters distributed throughout the city. To gain the confidence of older people, interviewers were mostly well-known residents of Amirkola. For example, one interviewer had been a health worker in Amirkola for 30 years. The interviewers initially visited older people in their homes to complete parts of the study questionnaire and then, the next day, the older person came to the Social Determinants of Health (SDH) Research Centre of the University of Babol in Amirkola to complete questionnaires and examinations and have fasting blood samples taken for biochemical and hormonal tests and bone density scanning. [Figure 1](#) shows how participants were recruited. Of the 958 people who did not participate after the first invitation, 155 responded to a second invitation and another 185 agreed to assessments in their homes, not in the study centre. In total, 1616 older people participated in this study. The final response rate was 72.3% (1616/2234).

How often have they been followed up?

Phone calls are made to all study participants every 6 months to ask whether they have had any falls, fractures or hospitalizations since the last phone call. For fractures, information about the fracture site, the date and the place of treatment is collected. Some information is also collected about the cause, date and place of hospitalization. It is planned to review medical records of the patients who report fractures or hospitalization to confirm the type of fracture (by radiograph) and details of hospitalization. Information about admission to elderly care centres and death will also be collected through the 6-monthly phone calls. The first 6-month follow-up has been completed. There were 26 deaths (1.6%) and only seven people (0.4%) could not be contacted ([Table 1](#)). It is planned that all participants will be re-examined every 2 years and the first follow-up will commence in September 2014.

What has been measured?

Data are collected via questionnaire, examinations and venepuncture. A questionnaire is administered by interviewers in subjects' homes and takes up to 60 min to do. The next day subjects come to the Social Determinants of Health (SDH) Research Centre of the University in Amirkola, where they spend about 120 mins.

A large number of tests are done during the visit to the study centre. These include questionnaires

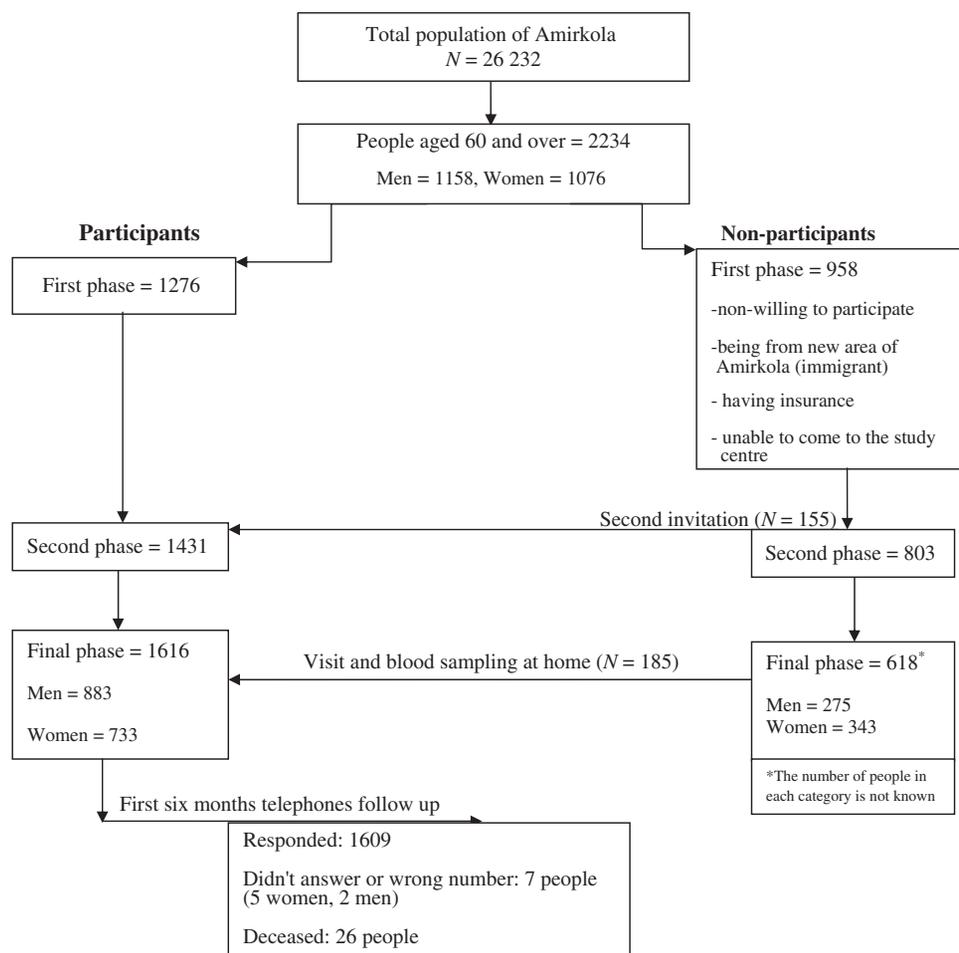


Figure 1 Flowchart of the data collection process of the AHAP, Iran (2011–12)

Table 1 Six-month follow-up data of AHAP, Iran (2011–12)

Variable	Men N (%)	Women N (%)
Falling	44 (0.05)	56 (0.08)
Fracture	12 (0.01)	16 (0.02)
Hospitalization	100 (11)	108 (15)
People died	16 (0.02)	10 (0.01)
No answer	2 (0.002)	5 (0.007)

[Katz, The Physical Activity Scale for the Elderly (PASE), International Prostate Symptom Score (IPSS), Geriatric Depression Scale (GDS), chronic pain], the Berg balance test, Mini Mental State Examination (MMSE), grip strength, quadriceps strength, measurement of blood pressure, height, weight, hip, waist and neck circumference (see Table 2). Finally, participants go to the radiology centre in Babol for bone densitometry using a Lexus apparatus, model 2008, made in France.

Participants come to the study centre in the morning and are asked not to eat anything beforehand. About 15 ml of fasting blood is taken at the clinic. Tests include complete blood count (CBC), iron (Fe), total iron-binding capacity (TIBC), ferritin, fasting blood sugar (FBS), triglyceride, cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), blood urea nitrogen (BUN), creatinine, uric acid, calcium (Ca), phosphorus (P), sodium (Na), potassium (K), prostate specific antigen (PSA), triiodothyronine (T₃), thyroxine (T₄), thyroid stimulating hormone (TSH), testosterone, vitamin D, parathyroid hormone (PTH) and urine analyses. Analyses are performed the same day in the laboratory of Shahid Beheshti Hospital in nearby Babol and the remaining blood is centrifuged, aliquoted and stored in a –80°C freezer in the Cellular and Molecular Research Centre of the University of Medical Sciences in Babol. DNA extraction is also performed in this Centre. Much of the methodology of this study is based on the CHAMP study currently being conducted in Australia.¹⁰

Table 2 Measurements in the AHAP, Iran (2011–12)

Measures	Instruments
Questionnaires	
Activities of daily living	Katz, ²⁰ Rosow–Breslau, ²⁰
Physical activity	Physical Activity Scale for Elderly (PASE) ²¹
Social support	Duke Social Support Index (11-item) ²²
Urinary symptoms	International Prostate Symptom Score (IPSS), ²³ International Consultation on Incontinence Questionnaire (ICIQ) ²⁴
Other: family history, (dementia, fractures, prostate cancer), health service use, lifestyle (alcohol, smoking), medical history and medications, pain (musculoskeletal and chronic) and socio-demographic characteristics	
Psychological health	Geriatric Depression Scale (15-item) ²⁵
Examinations	
Anthropometry	Height and weight, and hip, waist and neck circumference
Balance	Balance Berg test
Bone	Dual-energy X-ray absorptiometry (hip and spine)
Cardiovascular system	Blood pressure (lying and standing), heart rate
Cognitive function	MMSE, ²⁶ Logical Memory, ²⁷ DSM-IV TR, ^{a28} magnetic resonance imaging ^b
Strength	Grip strength, quadriceps strength ²⁹
Vision	Acuity
Routine biochemistry and haematology	Fe, TIBC, ferritin, Ca, P, Na, K, cholesterol (total and HDL), BUN, creatinine, uric acid, FBS, PSA, triglyceride, CBC (haemoglobin, leucocytes, platelets)
Bone-related measures	Bone turnover markers, PTH, vitamin D
Reproductive hormones	T ₃ , T ₄ , TSH, T ₃ resin uptake, progesterone, testosterone
DNA	Genes associated with ageing

^aDiagnostic and Statistical Manual of Mental Disorders, 4th Edn, text revision.

^bTests done in the Psychiatry Department.

If participants have a Geriatric Depression Scale score of 5 or higher or they have a Mini Mental State Examination score of 26 or lower they are referred to the Department of Psychiatry in Babol for further assessment. Also all participants are invited for dental and comprehensive eye examinations at Rohani Hospital in Babol.

What has the AHAP cohort found?

A total of 1616 participants were seen between the start of the study (April 2011) and the end of baseline (18 July 2012). The response rate was slightly higher for men (76%) than for women (68%). A recent survey of older people in Tehran also had a higher response rate in men than women.¹¹ This is different from studies in many other countries and may reflect cultural differences. Women may have had greater difficulty getting to the study centre: 38% of women

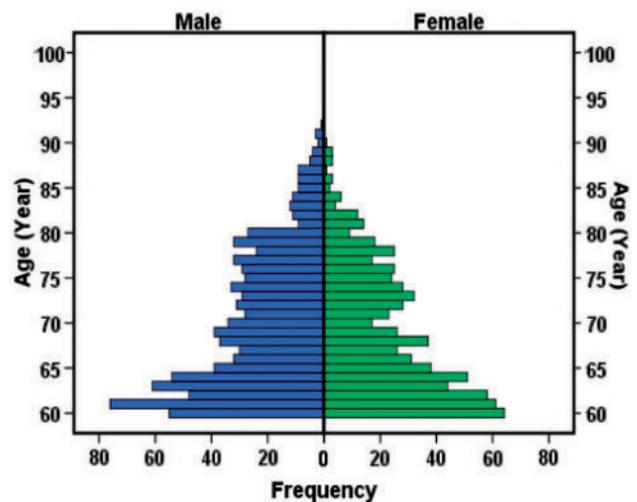


Figure 2 Distribution of older people based on age group in AHAP, Iran (2011–12). $N = 1616$, mean = 69.37, SD = 7.42

Table 3 Baseline socio-demographic characteristics of participants in the AHAP, Iran, 2011–12. *N* = 1616

Characteristic	<i>N</i> (%)
Age group (years)	
60–64	574 (35.5)
65–69	335 (20.7)
70–74	283 (17.5)
75–79	254 (15.7)
80 and over	170 (10.5)
Sex	
Male	883 (54.6)
Female	733 (45.4)
Marital status	
Married	1379 (85.3)
Widowed/widower	231 (14.3)
Divorced/separated	6 (0.3)
Never married	
Educational level	
Illiterate	1045 (64.7)
Primary	435 (26.9)
Secondary	30 (1.9)
High school	61 (3.7)
University	45 (2.8)
Occupational group	
Male	
Employed	486 (55.0)
Retired	339 (38.4)
Homemaker	35 (4.0)
Unemployed	14 (1.6)
Unknown	9 (1.0)
Female	
Employed	18 (2.5)
Retired	13 (1.8)
Homemaker	608 (82.9)
Unemployed	94 (12.8)

compared with 12% of men reported that they needed help travelling by car or public transport, and 48% of women compared with 22% of men reported needing help walking one km. Figure 2 shows the age and sex distribution of study subjects. The mean age of men (70.0 ± 7.7 years) is slightly higher than women (69.7 ± 7.0 years). Table 3 shows some socio-demographic characteristics of participants and Table 4 shows the prevalence of some self-reported medical conditions. Most participants are aged 60 to 69 years and the majority are illiterate. The prevalences of self-reported hypertension (41.2%) and diabetes

Table 4 Baseline prevalence of self-reported health conditions among participants in the AHAP, Iran, 2011–12. *N* = 1616

Conditions	<i>N</i> (%)
Angina	285 (17.6)
Chronic lung disease ^a	120 (7.4)
High blood pressure	666 (41.2)
Congestive heart failure	38 (2.4)
Heart attack	91 (5.6)
Depression	116 (7.2)
Diabetes	377 (23.3)
Dementia	29 (1.8)
Hypothyroidism	67 (4.1)
Osteoporosis	189 (11.7)
Stroke	83 (5.1)
Fractures	417 (25.8)
Parkinson's disease	17 (1.1)
Cancer	15 (0.9)
Headache	665 (41.2)
Epilepsy	38 (2.4)
Urinary incontinence	399 (24.7)

Participants were asked 'Has a doctor or other health care provider ever told you that you had or have...?'

^aChronic obstructive pulmonary disease, chronic bronchitis, asthma, emphysema.

mellitus (23.3%) are high. Although 25.8% of older people reported having had a fracture, only 11.7% of people reported having osteoporosis. Only 14.4% of older people considered their health as excellent or good in comparison with others at this age.

Bone densitometry was done for 1202 of the 1616 AHAP participants. The mean age of people who had densitometry was 68.5 ± 7.1 years, and of those who did not the mean age was 71.7 ± 7.9 years. As expected, bone density at the spine and femur was lower in women than in men (see Table 5). The prevalence of osteoporosis (T score ≤ -2.5) was 57.4% in women and 16.1% in men at either the femur neck or lumbar spine (see Figure 3). The prevalence of osteoporosis in AHAP is similar to other studies in Iran,^{12–14} Korea¹⁵ and India¹⁶ but higher than in Qatar¹⁷ and Turkey.¹⁸

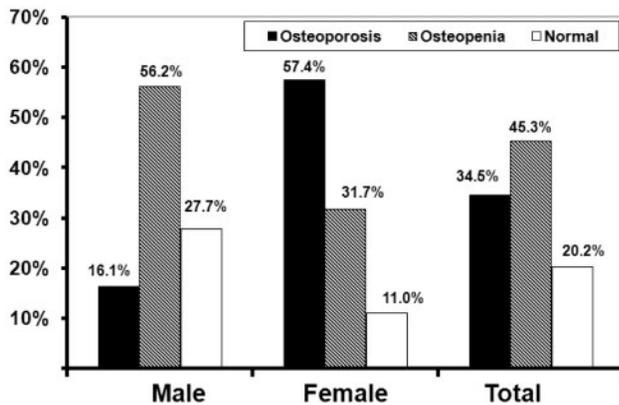
Vitamin D (25-OH-D) levels were also assessed¹⁹ and 38.2% were vitamin D deficient (<20 ng/ml) (see Table 6). There was no association between vitamin D levels and bone mineral density (see Figure 4).

What are the main strengths and weaknesses?

This is the first comprehensive cohort study of the health of older people ever conducted in Iran. There

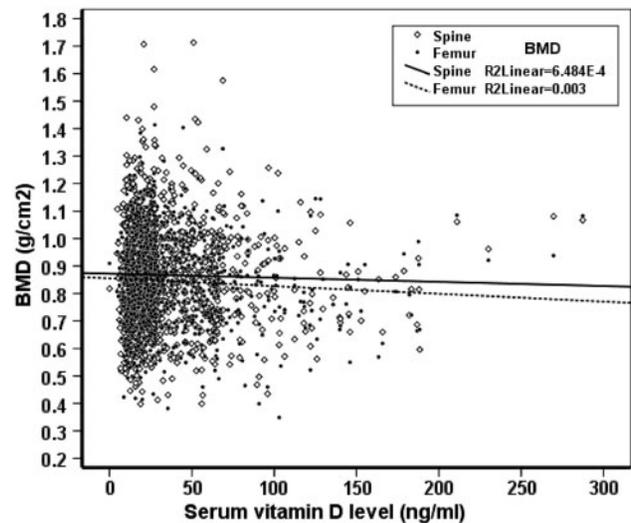
Table 5 Distribution of bone mineral density (BMD) and vitamin D in older people in AHAP, Iran, 2011–12. *N* = 1202

Variable	Men (mean ± SD)	Women (mean ± SD)	Total (mean ± SD)	<i>P</i> -value
Age (years)	69.08 ± 7.25	67.90 ± 6.80	68.55 ± 7.08	0.004
Spine BMD (g/mm ²)	0.93 ± 0.18	0.78 ± 0.16	0.87 ± 0.19	0.000
Femur BMD (g/mm ²)	0.89 ± 0.15	0.79 ± 0.14	0.85 ± 0.16	0.000
T-score (spine)	-1.07 ± 1.26	-2.40 ± 1.44	-1.66 ± 1.50	0.000
T-score (femur)	-1.13 ± 1.06	-1.81 ± 1.17	-1.43 ± 1.16	0.000
Vitamin D (ng/ml)	32.14 ± 28.31	37.01 ± 35.14	34.31 ± 31.62	0.010

**Figure 3** Distribution of older people based on bone mineral density in AHAP, Iran (2011–12). *N* = 1202**Table 6** Distribution of Vitamin D level by sex in older people in AHAP, Iran, 2011–12. *N* = 1610

Sex	Vitamin D deficient (<20 ng/ml) <i>N</i> (%)	Vitamin D insufficient (20–29.99 ng/ml) <i>N</i> (%)	Vitamin D sufficient (≥30 ng/ml) <i>N</i> (%)
Male	321 (36.4)	308 (34.9)	253 (28.7)
Female	294 (40.4)	174 (23.9)	260 (35.7)
Total	615 (38.2)	482 (29.9)	513 (31.9)

was a high baseline participation rate (1616/2234). Participants too ill or otherwise unable to come to the study centre were examined in their own homes. We anticipate low loss to follow-up. Amirkola is a small town and there is very little migration in or out. The 6-month phone calls will maintain subjects' interest in the study. The wide range of information obtained from this study will provide the opportunity for doing many sub-studies about the relationships among medical conditions, geriatric syndromes and physiological and genetic factors. Our study includes men and women and so we will be able to make comparisons between sexes.

**Figure 4** Association between vitamin D and bone mineral density in older people in AHAP, Iran (2011–12). *N* = 1202

The main weakness of this study is lack of data about midlife when ageing processes start to occur. Another weakness is that we did not collect any data from non-respondents.

Most of the participants in AHAP are illiterate but this should not compromise the quality of the study. Informed consent was obtained after giving an oral explanation of the study. We used interviewer-administered questionnaires throughout. The MMSE needed to be slightly modified for illiterate participants, using pictures instead of written instructions to ask participants to 'close your eyes'.

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

We would like to invite all researchers interested in using the information to contact the principal investigator Seyed Reza Hosseini (hosseinim46@yahoo.com).

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Conflict of interest: None declared.

KEY MESSAGES

- Very little information is available about the health of older people in Iran.
- The Amirkola Health and Ageing Project ($n = 1616$) is a comprehensive study of the health of people aged 60 years and over living in a small town near the Caspian Sea.
- Interesting baseline findings include the high prevalence of illiteracy (65%); fair, poor or very poor self-rated health (86%); vitamin D deficiency or insufficiency (68%); and osteoporosis in women (57%).

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