Prevalence of Risk factors for non-communicable chronic disease in Shaanxi province of China

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Abstract

Background Risk factors including both behavioral risk factors (BRFs) and biological risk factors contribute majorly to the development of non-communicable chronic diseases. We aimed to explore the covariation, cluster and distribution of risk behaviors in Shaanxi province of China. **Methods** Multistage clustering sampling was adopted to select participants for the survey. We obtained the data and investigate the prevalence and clustering pattern (mean number of risk factors) of eight risk factors for non-communicable chronic diseases, including four behavioral risk factors (smoking, drinking, consumption of fruit and vegetables, physical activity) and four biological risk factors (overweight and obesity, raised blood pressure, raised fasting blood glucose and raised total serum cholesterol). Ordinal logistic regression was conducted to investigate the independent demographic and socioeconomic covariates of clustering of the eight risk factors. **Results** The prevalence of eight risk factors in Shaanxi province were found: insufficient fruit and vegetable intake, 59.82%; overweight and obesity, 46.82%; raised blood pressure, 30.88%; current smoking, 28.21%; physical inactivity, 24.63%; raised total serum cholesterol, 20.96%; raised blood glucose, 4.27% and harmful use of alcohol, 2.16%. 64.73% of the Chinese in Shaanxi province had two or more risk factors. Being a male, old, living in rural areas, having a lower education level and being separated, divorced or widowed all tends to have more risk factors. **Conclusion** There is a high prevalence of risk factors for non-communicable chronic diseases among residents in Shaanxi province of China. Public health interventions are needed to reduce these risk factors and ought to target those who are male, old, poorly educated and live in rural areas.

Background

Non-communicable chronic diseases (NCDs) such as cardiovascular diseases, diabetes and cancers have become the leading causes of death each year all over the world [1]. Some risk factors, comprising both modifiable behavioral risk factors (BRFs) and biological risk factors, such as tobacco use, excessive drinking, physical inactivity, unhealthy diet, overweight or obesity, dyslipidemia, raised blood pressure and abnormal blood glucose, contribute majorly to the development of NCDs [2, 3]. Evidence has shown that risk factors usually occur in specific patterns of combinations other than in one risk factor [4, 5]. Moreover, combinations of these risk factors have synergistic effects on development of some NCDs [6, 7]. More number of them increases the risk of adverse health outcomes and mortality compared with having no risk factors [8, 9]. Therefore, understanding patterns of risk factors could be useful for modeling the incidence of disease. And the effect of combined risk factors intervention for program design might be enhanced more than single risk factor intervention [10].

The covariation, cluster and distribution of risk behaviors have been well documented in developed countries [11, 12]. The mean number of risk factors was 1.68 for the U.S. adults and only 5.9% of them adhered to all the lifestyle recommendations [13, 14]. Recent studies in China have shown 57.0% of Chinese population had at least 2 risk factors and the mean number of them is 1.80 in 2007 and 1.61 among Chinese women in 2010 [15, 16]. There are, however, few studies in northwest China focusing on the clustering and distributions of multiple risk factors. And the imbalance in socioeconomic status and

development, as well as health care between East China and West China, which may result in disparity in risk factors prevalence and distribution [17, 18]. Examining and identifying characteristics of multiple risk factors among population in northwest China could lead to more targeted intervention programs in this area. The current study was conducted in Shaanxi, an area that is a low-middle income province in the northwest, in common with many west areas in China. Study objectives are: to obtain information on clustering and correlations of eight risk factors; to describe different multiple risk factors patterns; and to examine their potential socioeconomic determinants associated with risk factors.

Methods

Surveillance and study sample

A cross-sectional study on chronic disease and its risk factors was conducted at 10 surveillance districts/counties (Lianhu, Huayin, Chencang, Meixian, Jingyang, Baota, Huangling, Shangzhou, Xunyang and Lueyang) in Shaanxi province from October to December 2015. The ethics committee of the Chinese Center for Disease Control and Prevention approved the implementation of the survey and written informed consent was obtained from each participant.

Complex multistage cluster sampling design was used to select the participants. In the first sampling stage, three subdistricts or townships were selected from each surveillance district/county with systematic sampling. In the second stage, two villages or communities were selected from each chosen subdistrict or township with the same sampling method. In the third stage, households were selected from each chosen village or community using simple random sampling method. Finally, all individuals at or above 18 years old from 45 chosen families were invited to participate the surveillance.

The sample size was calculated according to the China Chronic Disease and Risk Factor Surveillance (CCDRFS), which conducted in 302 surveillance districts/counties nationwide. , where $u=1.96$; p was 9.7%, which was the prevalence of type II diabetes in China in 2010; d_{eff} (the design effect) was 3; $r=20\%$, which was the relative error, $d=20\% \times 9.7\%$ Taking into consideration the demographic differences and urban-rural disparity in China, the sample size was stratified by 31 provinces, autonomous regions, and municipalities of mainland China and urban/rural. A total of 185000 participants were designed to select for the surveillance nationwide. 6120 participants were assigned to investigate in Shaanxi province, which was a typical area of northwest China, environmentally and culturally [19]. Study has shown that the estimates were representative of Shaanxi population [20]. Details of establishment, history and good representativeness of CCDRFS were published elsewhere [21, 22]. In total, 6174 interviews were fully completed in Shaanxi province. All questionnaires, physical and laboratory examinations were developed by standard procedures. The qualified staff from local CDC and doctors from local hospital as investigators engaged in the field activities after training courses and standard exams. We collected the behavioral risk factors for NCDs by face-to-face interviews. Height, weight and blood pressure of each participant were measured. Blood glucose was conducted in local laboratories and blood lipids in KingMed Diagnosis, a third party testing company in Guangzhou. Details on surveillance design,

laboratory examination procedures, blood sample transport and quality control has been published elsewhere [23, 24].

Measures

We invited participants to answer questions about their tobacco use, alcohol drinking, diet pattern, physical activity. Physical measurements including height, weight were obtained to calculate body mass index (BMI) and define individuals who were overweight or obesity. Blood pressure, blood glucose and blood lipids were tested at laboratories. Current smokers were defined as participants who reported that they smoked 'every day' or on 'some days' currently. Those who reported 'no' were defined as non-current smokers. We define harmful use of alcohol as consuming pure alcohol $\geq 61\text{g}$ per drinking day for men and $\geq 41\text{g}$ for women [25]. Food frequency questionnaires (FFQ) were used to collect information on fruit and vegetable intake. Consumption of less than 400 g of fruit and vegetables combined per day was considered insufficient [26]. We used Global Physical Activity Questionnaire (GPAQ) to assess physical activity of each participant [27]. According to the GPAQ analysis guide, Physical inactivity was defined as those with ≤ 150 minutes of moderate physical activity or 75 minutes of vigorous activity or an equivalent combination of moderate and vigorous PA achieving less than 600 MET-minutes (Metabolic Equivalents) per week [28].

Each participant had three times blood pressure measurements in succession using a calibrated electronic blood pressure device (HBP-1300, Omron Co, Kyoto, Japan), with at least 1 minute rest between measurements. The second and third measurement was used in our analysis. Blood samples of each participant were drawn to measure plasma glucose and serum cholesterol after fasting for ≥ 10 hours. Plasma glucose concentration was tested at the local laboratory under a standardized quality control. Serum samples were collected within 2 hours and tested in the laboratory of a third party company (KingMed Diagnosis, Inc., Guangzhou, China), which was certificated by China's Ministry of health. Body mass index (BMI) ≥ 24 was defined as overweight and obese [29]. Blood pressure $\geq 140/90$ mmHg was defined as raised blood pressure [30]. According to WHO 1999 criteria, fasting plasma glucose level ≥ 7.0 mmol/L or taking medication for diabetes mellitus was diagnosed as raised blood glucose. Total serum cholesterol $\geq 6.22\text{mmol/L}$ was defined as raised total cholesterol based on the Guidelines for Prevention and Treatment of Adult Hyperlipidemia in China [31]. The four behavioral risk factors and four biological risk factors are the main indicators investigated and measured based on the recommendations by WHO [32].

Statistical analyses

In our research, an analysis weight of each participant was considered due to the complex multistage sampling. It was obtained based on the surveillance sampling scheme and post-stratification factor, which adjustments for age and gender using 2015 Chinese population estimates from National Bureau of Statistics of China.

The overall distributions of participants' characteristics, including demographic characteristics, socioeconomic status, rural/urban residence, were examined. Prevalence of each risk factor was presented and χ^2 tests were performed to test its distribution difference. Distribution of number of risk factors (range, 0–8), as well as the prevalence of first 15 leading clustering patterns of the eight risk factors, were then presented. Next, the mean number of risk factors that each participant had was determined to manifest their clustering pattern within individuals. Finally, we explore the independent effects of demographic and socioeconomic covariates on risk factors' clustering pattern by modeling an ordinal logistic regression (ordinal number of risk factors was the dependent variable). We carried out all statistical analyses using SPSS version 25.0 with weighted data.

Results

In this study, the majority of the respondents were between 18 and 44 years old (57.78%), male (51.13%), either married or cohabiting (85.48%) and living in rural areas (53.84%). The most common education level was junior high school graduate (39.20%), but one fifth of the respondents was illiterate or had some primary school (Table 1).

The prevalence of insufficient fruit and vegetables consumption is 59.82%, followed by overweight and obesity, 46.82%; raised blood pressure, 30.88%; current smoking, 28.21%; physical inactivity, 24.63%; raised total serum cholesterol, 20.96%; raised blood glucose, 4.27% and harmful use of alcohol, 2.16%. Insufficient fruit and vegetable consumption, raised blood pressure, raised blood Glucose and raised total cholesterol, these four risk factors increased significantly with age and declined with higher educational level ($P < 0.0001$). Respondents living in rural areas intake fewer vegetables and fruit than those in urban areas (67.62% vs. 50.60%) and their blood pressure is higher (35.38% vs. 25.62%) (Table 2).

Only 8.71% of the individuals had none of the eight risk factors; the prevalence of individuals had the number of risk factors from one to four or more is 26.56%, 27.94%, 21.04% and 15.74%, respectively (Fig. 1). The first 15 most prevalent clustering patterns showed in table 3, among which the most prevalent clustering pattern was insufficient intake of fruit and vegetable (11.71%). Similarly, among those with two risk factors, the group of insufficient intake of fruit and vegetable and overweight or obesity was the most common (5.42%). The combination of insufficient intake of fruit and vegetable and overweight or obesity tops among two-factor patterns (5.42%). Insufficient fruit and vegetable consumption and overweight or obesity and raised blood pressure overlapped for 3.03% of respondents. (Table 3).

Finally, we explored the independent effects of social-demographic variables on risk factors clustering using an ordinal multivariate logistic model (Table 4). The average number of the risk factors each respondent was 2.13 and increased with age ($P < 0.01$). Men had more risk factors than women. Those at the ages of 18 to 44 had fewer risk factors than those above 60 years old (1.79 vs. 2.84). Participants with higher education had fewer risk factors. Respondents living in rural areas had more risk factors than those in urban areas (2.28 vs. 1.94). Five of the variables were found to be associated with multiple risk factors. Among the demographic characteristics, individuals aged 60 years old or above were 3.63 times

more likely to have more risk factors than those aged 18–44 years. Women were less likely to have multiple BRFs than men. Among the social-demographic characteristics, living in a rural area, having a lower education level and being separated, divorced or widowed all increased the likelihood of having more risk factors.

Discussion

To our knowledge, this is the first study on clustering pattern of risk factors of non-communicable chronic disease in northwest China where less developed than other areas of China. We found insufficient fruit and vegetables intake led all the eight behavioral and biological risk factors we observed, followed by overweight or fat and raised blood pressure. The study also suggested that each person in Shaanxi province had 2.13 risk factors on average and insufficient fruit and vegetable intake combined with overweight or fat, or with smoking are the two major clustering patterns. Those who are male, living in rural areas, having a lower education level and not being married increased the possibility of having more risk factors.

Our study demonstrated that more than half of the population in Shaanxi province intakes insufficient fruit and vegetables, which was the highest prevalence among all the eight risk factors we explored. The prevalence is higher than the average Chinese national level, as well as that of the east areas of China [21,22,33]. Prevalence of overweight and obesity estimated in this study which ranked second was similar to the national average, while raised blood pressure ranking third was higher than the national level [22]. Shaanxi province is located in the semi-arid areas where vegetables and fruits are less diverse than the east and south of China. Instead of considering vegetables and fruits to be dietary necessities, noodles and mantou (a kind of steamed bread) are the staple food for local residents. Although access to vegetables and fruits are much easier due to the modern transportation, a decrease was still observed in the proportion of adults meeting the minimum recommendations for vegetables and fruits [34].

Risk behaviors related to lifestyle often established in childhood and could persist along with adulthood and they are usually hard to change without appropriate intervention [35, 36]. Compared with having no risk factors, having two risk factors increases the risk of mortality substantially [37]. And adhering to healthy behaviors decreases the risk of non-communicable chronic diseases and mortality [38, 39]. In this study, nearly two thirds of participants engaged in at least two risk factors of non-communicable chronic disease, which suggested a large number of residents in Shaanxi province are most likely to develop non-communicable chronic diseases and mortality. Public health services and primary care system may encounter big challenges in the future.

Studies have suggested that many behavioral risk factors and biological risk factors vary concurrently [40, 41]. For instance, we found that insufficient fruit and vegetables consumption, overweight or obesity and raised blood pressure are concurrent and they are a cluster pattern of risk factors in this study. All of these three risk factors mentioned above could lead to hypertension [42-44]. Vegetables and fruit are rich in minerals, vitamins, folic acid and flavonoid, which have been suggested to lower blood pressure

through benefiting endothelial function, improving antioxidant activity and modulating baroreflex sensitivity[45-48]. In addition, increased vegetables and fruits consumption might have increased dietary fiber consumption and reduced carbohydrates and fat intake. High carbohydrates and fat consumption has been demonstrated to be positively associated with risk of hypertension, as well as overweight and obesity [49-51]. The significant relationship between overweight and obesity and hypertension has been also well documented [52, 53]. As a result, public health intervention program focus only on reducing hypertension might yield little. Interventions to reduce both overweight and obesity and insufficient intake of vegetables and fruits simultaneously might therefore be mutually reinforcing and it could generate substantially larger health gains in hypertension prevention.

The findings in our study corroborates the results of China's national level 5-8 year before that the number of risk factors increased with age, lower education level, and male, those not being married and living in rural areas reported more risk factors [15, 16]. The study in Shaanxi province still showed that people with lower SES bear heavier burden of risk factors, both in behavior and biology. As the economy is less developed in the northwest than the east, most people, especially those living in rural areas have less access to health education and primary care. Chinese government has noticed the daunting social inequality in health and a series of projects aiming to reduce it in recent years, such as Health China 2030, The Anti-Poverty, Health in China, have been implemented. These projects have become the state policy and may have numerous achievements. However, the covariation, cluster pattern and distribution of risk factors on NCDs implied that it is essential to design and implement interventions that would target a range of risk factors found in this study. The findings may contribute to the precise prevention in public health strategies.

To our knowledge, this is the first study to investigate the co-variations, clustering, and correlates of multiple chronic disease risk factors in northwest China. As part of CCDRFS, the standard interview and laboratory test process guarantee the data quality. However, several limitations of the present study need to be acknowledged. First, having been adopted as indicators of Chinese national NCDs monitoring, these eight risk factors were included in this study. While some other important risk factors, such as salt intake and sleep deprivation, were not involved. Second, though BMI, blood pressure, glucose and total cholesterol, these four biological risk factors were measured or tested in laboratories, all the behavioral risk factors are self-reported and may have suspected to recall bias. Third, behavioral and biological risk factors as risk factors for NCDs were combined for analysis in this study. Their respective clustering pattern, distribution and even association with each other ought to be studied further. Fourth, the income of a substantial proportion of the participants was not collected in the survey. This may have misjudged their SES. Finally, we explored 8 risk factors and their relationship, but their different danger degree and susceptibility to chronic disease should be explored further.

Conclusions

The current study, together with prior studies suggests that several risk factors of NCDs are prevalent in Shaanxi province and they are correlated. Comprehensive and integrated public health policies and

interventions targeting multiple risk factors are needed, especially for those with low SES.

Abbreviations

NCDs: Non-communicable chronic diseases; BRFs: behavioral risk factors; CCDRFS: China Chronic Disease and Risk Factor Surveillance; CDC: centers for disease control and prevention; BMI: body mass index; GPAQ: Global Physical Activity Questionnaire; PA: physical activity; WHO: world health organization

Declarations

Ethics approval and consent to participate

The ethics committee of the Chinese Center for Disease Control and Prevention approved the implementation of the survey and written informed consent was obtained from each participant.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

We declare that none of the authors have any competing interests.

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Authors' contributions

FL conceived the study. LQ and RS ran the study and supervised data collection. WW conducted the data analysis and completed the manuscript. ZZ and XL interpreted the data and critically revised the manuscript for important intellectual content. All authors have read and approved the manuscript.

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Tables

Table 1 Characteristics of the participants in the study

Characteristic	Cumulative	Frequency(N = 6174)	Percent (%) ^{Weighted}
Gender			
	Male	3001	51.13
	Female	3173	48.87
Age, years			
	18-44	1825	57.78
	45-59	2528	26.14
	60-high	1821	16.08
Marital status			
	Single	252	11.43
	Married or cohabiting	5634	85.48
	Divorced / Widowed / Separated	288	3.09
Education			
	Illiterate or some primary school	1713	20.58
	Primary school	1178	16.23
	Junior high school	2184	39.20
	Senior high school	803	15.20
	College or above	296	8.80
Location			
	Urban	2643	46.16
	Rural	3531	53.84

Table 2 Estimated prevalence of risk factors for non-communicable chronic diseases, Shaanxi province of China, 2015*

Characteristic	Current smoking	Harmful use of alcohol	Insufficient fruit and vegetable intake	Physical inactivity	Overweight or obesity	Raised blood pressure	Raised blood glucose	Raised total cholesterol
Total	28.21(27.09-29.34)	2.16(1.8-2.52)	59.82(58.58-61.05)	24.63(23.55-25.7)	46.82(45.58-48.07)	30.88(29.72-32.03)	4.27(3.75-4.79)	20.96(19.94-21.98)
Gender								
Male	53.72(51.93-55.5)	3.81(3.12-4.49)	58.47(56.69-60.25)	24.81(23.27-26.36)	49.65(47.86-51.44)	30.66(29.01-32.31)	4.34(3.58-5.09)	19.88(18.44-21.31)
Female	1.53(1.1-1.95)	0.43(0.2-0.66)	61.22(59.51-62.93)	24.44(22.94-25.93)	43.87(42.14-45.6)	31.1(29.49-32.72)	4.2(3.49-4.92)	22.09(20.64-23.54)
<i>P</i> for test the differences in prevalence	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Age, years								
18-44	25.7(23.69-27.7)	2.36(1.66-3.05)	55.74(53.44-58.04)	26.00(23.99-28.02)	43.91(41.63-46.19)	15.77(14.1-17.45)	1.4(0.85-1.95)	13.54(11.96-15.12)
45-59	32.56(30.74-34.39)	1.84(1.32-2.37)	63.2(61.3-65.09)	19.90(18.34-21.46)	54.46(52.52-56.4)	41.98(40.05-43.9)	5.4(4.5-6.31)	29.72(27.93-31.51)
60-high	30.19(28.08-32.3)	1.95(1.32-2.59)	68.96(66.82-71.11)	27.39(25.34-29.44)	44.89(42.6-47.18)	67.07(64.91-69.23)	12.86(11.28-14.44)	33.4(31.23-35.58)
<i>P</i> for test the trend	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Education								
Illiterate or some primary school	20.02(18.12-21.91)	2.18(1.48-2.87)	70.01(67.83-72.19)	29.96(27.79-32.13)	46.33(43.96-48.69)	51.47(49.1-53.84)	5.87(4.73-7.01)	32.66(30.43-34.89)
Primary school	30.05(27.43-32.68)	1.76(1.01-2.51)	65.92(63.2-68.64)	22.57(20.18-24.96)	46.54(43.69-49.39)	34.27(31.56-36.99)	4.7(3.46-5.94)	22.84(20.43-25.25)
Junior high school	32.37(30.41-34.33)	2.6(1.93-3.27)	58.58(56.5-60.67)	22.33(20.58-24.08)	46.1(44.01-48.19)	26.35(24.5-28.2)	3.81(2.98-4.64)	16.45(14.89-18.01)
Senior high school	31.03(27.83-34.24)	1.23(0.47-2)	54.62(51.13-58.1)	22.50(19.6-25.39)	50.52(47.05-53.98)	20.92(18.1-23.74)	3.63(2.3-4.97)	17.51(14.87-20.15)
College or above	20.62(15.98-25.25)	2.48(0.7-4.26)	37.82(32.11-43.54)	29.89(24.64-35.13)	45.35(39.65-51.06)	13.75(9.8-17.7)	2.93(0.98-4.87)	16.28(12.05-20.51)
<i>P</i> for test the trend	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Marital status								
Single	34.43(28.52-40.33)	0.24(-0.37-0.86)	59.68(53.52-65.84)	32.66(26.83-38.49)	31.95(26.15-37.75)	14.15(9.82-18.48)	0.76(-0.36-1.88)	12.18(8.11-16.26)
Married or Cohabiting	27.45(26.29-28.62)	2.37(1.97-2.76)	59.34(58.05-60.63)	23.29(22.19-24.4)	49.12(47.81-50.43)	31.89(30.68-33.11)	4.51(3.96-5.07)	21.71(20.63-22.79)
Divorced / Widowed / Separated	26.3(21.19-31.42)	3.46(1.34-5.58)	73.27(68.13-78.41)	31.95(26.54-37.37)	38.32(32.67-43.96)	64.64(59.08-70.19)	10.34(6.72-13.95)	33.17(27.66-38.68)
<i>P</i> for test the differences in prevalence	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Location								
Urban	24.41(22.77-26.04)	2.15(1.6-2.7)	50.60(48.67-52.53)	26.15(24.48-27.83)	47.86(45.96-49.77)	25.62(23.96-27.29)	5.19(4.31-6.07)	21.33(19.76-22.9)
Rural	31.48(29.95-33.01)	2.16(1.68-2.64)	67.62(66.07-69.17)	23.32(21.93-24.72)	45.93(44.29-47.58)	35.38(33.8-36.96)	3.54(2.92-4.16)	20.65(19.31-21.99)
<i>P</i> for test the differences in prevalence	<0.0001	0.0092	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

*All prevalence and 95% CIs were weighted with complex weights.

Table 3 First 15 leading Clustering pattern of multiple chronic disease risk factors in Chinese adults, Shaanxi province of China

Number of Risk factors	Current smoking	Harmful use of alcohol	Insufficient fruit and vegetable intake	Physical inactivity	Overweight or obesity	Raised blood pressure	Raised blood glucose	Raised total cholesterol	Weighted percent (95%CI)
1	NO	NO	YES	NO	NO	NO	NO	NO	11.71
0	NO	NO	NO	NO	NO	NO	NO	NO	8.71
1	NO	NO	NO	NO	YES	NO	NO	NO	5.66
2	NO	NO	YES	NO	YES	NO	NO	NO	5.42
2	YES	NO	YES	NO	NO	NO	NO	NO	4.12
3	NO	NO	YES	NO	YES	YES	NO	NO	3.03
1	YES	NO	NO	NO	NO	NO	NO	NO	2.63
2	NO	NO	YES	NO	NO	YES	NO	NO	2.44
3	YES	NO	YES	NO	YES	NO	NO	NO	2.26
2	NO	NO	NO	NO	YES	YES	NO	NO	2.15
2	NO	NO	YES	YES	NO	NO	NO	NO	2.15
1	NO	NO	NO	YES	NO	NO	NO	NO	2.10
2	YES	NO	NO	NO	YES	NO	NO	NO	2.07
3	NO	NO	YES	YES	YES	NO	NO	NO	2.05
4	NO	NO	YES	NO	YES	YES	NO	YES	1.66

Table 4 Average number of risk factors and its covariates of chronic disease among Chinese, Shaanxi province of China

Characteristics	Average number (95% CI)	OR(95% CI)
Total	2.13(2.10-2.17)	
Gender		
Male	2.41(2.36-2.46)	-
Female	1.85(1.81-1.90)	0.39(0.39-0.39)
Age group		
18-44	1.79(1.73-1.85)	-
45-59	2.45(2.40-2.50)	2.37(2.36-2.37)
60-high	2.84(2.78-2.90)	3.63(3.63-3.64)
Marital status		
Single	1.76(1.61-1.92)	-
Married or cohabiting	2.16(2.12-2.19)	1.36(1.36-1.36)
Separated/Divorced/Widowed	2.80(2.66-2.93)	1.64(1.64-1.65)
Education		
Illiterate or some primary school	2.55(2.49-2.61)	-
Primary school	2.24(2.17-2.32)	0.66(0.66-0.66)
Junior high school	2.04(1.98-2.10)	0.63(0.62-0.63)
Senior high school	1.97(1.88-2.06)	0.59(0.59-0.59)
College or above	1.62(1.48-1.75)	0.51(0.50-0.51)
Place of residence		
Urban	1.94(1.89-2.00)	-
Rural	2.28(2.24-2.32)	1.43(1.43-1.43)

Figures

Figure 1

Prevalence of multiple risk factors for risk factors among Chinese adults, northwest China (All prevalence were weighted with complex weights)