

Physical exercise status of residents in Tibet, China—Data from 2018 National Health Service Survey

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Abstract

Background: Physical inactivity is responsible for more than three million deaths worldwide. This research is to get a sense of the physical inactivity in Tibet, a region with an average elevation of over 4,000 meters, since the prevalence of physical inactivity in Tibet and its correlates factors were few studied and the physical exercise situation in the plateau area is a topic that needs to be understood in the field of public health.

Methods: The Sixth National Health Service Survey in Tibet, a population-based door-to-door survey. A multistage stratified sampling design was used to select eligible households. We used Univariate analysis and Logistic regression analysis to examine status of physical exercise.

Results: A total of 9,436 individuals were analyzed in this study with mean age of 40.81 years old. The prevalence of physical inactivity was 59.4%, and the highest with adults of 25~44 years old. It was showed that household register, educational degree, marital status, employment status, prefecture-level, smoking, drinking, health records and physical examination were associated with physical exercise ($p < 0.001$).

Conclusion: Numerous residents in Tibet have a highly insufficient physical exercise, promoting the health awareness to engage Tibetan residents in physical exercise at the recommended level is conducive.

Background

Physical inactivity, malnutrition, tobacco use and excessive drinking have been identified as the most significant preventable risk factors for non-communicable diseases[1]. There were strong evidence indicated that lack of physical activity increased the incidence of many non-communicable diseases such as coronary heart disease[2], type II diabetes[3], breast[4] and colon cancers[5], and shortened life expectancy[6]. With most of the world's population is inactive, this link poses a major public health problem[6]. In addition, various studies have indicated that physical activity is a determinant of longevity, in the healthy and the ill alike[7-9]. A great quantity of evidence has shown that regular and appropriate physical activity is a protective factor can prevent the incidence of all kinds of chronic diseases, reduce the psychological burden and improve the quality of life from all aspects[8-10]. Based on this, the 2013-2020 global action plan on non-communicable diseases (NCDs) set the relative reduction of physical activity deficiency rate by 10% as one of the nine goals to be achieved by 2020[11].

Tibet is located in the southwest of Qinghai-Tibet Plateau, with an average altitude of over 4,000 meters, which is known as the "roof of the world". Due to its special geographical environments and climates, the lifestyles and behavior habits of residents in Tibet are obviously different from those in other part of China. Most of the residents in Tibet live in scattered areas, mainly in agriculture area and animal husbandry area. Numerous residents in Tibet have strong religious beliefs, and it is their daily activities to convert the scriptures and worship. But we know little about their physical exercise situation. Therefore, in

order to understand the prevalence of physical inactivity and the relevant factors affecting physical exercise of people in Tibetan areas, this study adopts the results of the Sixth National Health Service Survey in Tibet 2018 on people aged 15 to 65 years old for analysis.

A large segment of studies had investigated the factors correlated to the sufficient levels of physical exercise among people of disparate ages in diverse countries and regions. We learned about physical exercise status in parts of the world at high altitudes. Across Africa, the prevalence of physical inactivity in the STEPs survey among individuals ranged from 4.3% in Uganda[12] to 9.5% in Malawi[13] for people at high altitudes, and from 50.7% in Mauritania to 85.7% in Ghana[13] for people at lower altitudes. Much of these data shows that the prevalence of physical activity is linked to geography and economic development. In China, precise assessments of physical activity in different regions also varies highly[14-17], but little attention has been paid to Tibet.

Methods

Objects of investigation

The study used data from the Sixth National Health Services Survey, a multi-stage, stratified, cross-sectional survey conducted in Tibet in 2018. According to the characteristics of economic development level, geographical location and population distribution, seven prefectures in the region were divided into three levels: better (Lhasa, Nyingchi), general(Xigaze, Shannan and Qamdo) and poor(Nagqu and Ali). Conduct sampling survey according to PPS(probability proportionate to size sampling, PPS) method. 24 counties were selected from 73 counties in Tibet autonomous region according to the proportion of 32%, 55 townships were selected from the counties, 165 villages were selected from the townships, and 20 households were randomly selected from each village by chance. A total of 9,436 questionnaires were obtained, of which 9,436 were valid, and the effective rate was 100%. A face-to-face questionnaire survey was conducted using the Family Health Questionnaire. Informed consent was signed.

Classification into physical activity categories

According to the frequency, physical exercise can be divided into "Often", "Sometimes", "Occasionally" and "Never". "Often" refers to 6 or more times of exercise a week, with each exercise lasting more than 30 min or 3-5 times a week, with each exercise lasting more than 60 min. "Sometimes" means exercising more than 6 times a week, but each exercise lasts less than 30 min, or exercising 3-5 times a week, each exercise lasts less than 60 min, or exercising 1-2 times a week, each exercise lasts more than 90 min. "Occasionally" means exercising once or twice a week for a duration of less than 90min or less than once a week for a duration of more than 30 min. "Never" means never exercising(No omission in these classification).

Socio-demographic and biological variables

The socio-demographic data used in this study mainly included gender, age(15 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 65), the household register(agricultural and pastoral areas, city, others), ethnic group(Han, Tibetan, others), marital status (in marriage, not in marriage), degree of education(illiteracy, primary school, junior high school, high school includes technical school, college and above), the employment situation(employed, unemployed), prefecture-levels(Lhasa, Xigaze, Shannan, Nyingchi, Qamdo, Naqu, Ali), etc.

Life related variables and definitions

It mainly included health behaviors(smoking, drinking) and health consciousness (health records, physical examination). Smoking status was divided into three categories: "smoking", "smoking cessation", "never smoking"; the drinking status was divided into three categories: "drink alcohol within 30 days", "drink alcohol before 30 days", "never drink alcohol"; health records were divided into three categories: "yes", "no, but know" and "don't know"; there were two types of physical examination: "yes" and "no".

Statistic analysis

Descriptive statistics and multivariate Logistic regression analysis were used to study the prevalence of physical inactivity and its possible related factors. The Chi-square test was used to investigate the binary relationship between variables and physical inactivity, and the adjusted Logistic regression was used to examine the possible relationship with physical inactivity. The quantitative data were described by (means \pm standard deviation) and the qualitative data by percentages(%). The results were expressed as odds ratio(ORs) and 95% confidence interval(CIs). $p < 0.05$ was considered statistically significant. All analyses were performed using SPSS.

Results

In 2018, a total of 9,436 Tibetan residents aged 15 to 65 years old participated in the Sixth National Health Service Survey, all completed the questionnaire, with an effective rate of 100.0%. The average age of the subjects was 40.81 years old.

Physical exercises status

Table 1 shows the status of physical exercises of Tibetan residents aged 15 to 65. A total of 3,832 individuals participated in the exercise, with the average duration of each exercise being 55.33 min. The highest proportion was found in those who exercised 6 times or more a week, accounting for 17.0%; among the duration of exercise, each exercise less than 30 minutes accounted for the largest proportion(21.9%); as for comprehensive exercise frequency and duration, the highest proportion was found in those who exercised "Sometimes", accounting for 15.0%.

Demographic characteristics of subjects

Descriptive analysis of physical activity including social demographic variables, health behaviors and health consciousness are provided in Table 2. The results showed that 5,604 people(59.4%) were inactive. The proportions and physical activity rate of women were both little higher to men. The age distribution showed an inverted U-shape, but the rate of physical activity in the age distribution is U-shaped, and the prevalence was highest in the youngest age group aged 15~24 years, followed by the oldest group (55-65 years). Residents who lived in agricultural and pastoral areas accounted for the largest share of 79.1% and Tibetan residents constituted almost the entire population(96.9%). Compared with cities(64.3%) the physical exercise rate of farmers and herdsmen(34.4%) is generally low. And Tibetans(40.2%) were lower than other ethnic groups. Nearly half(45.2%) are illiterate, and less than 10% have a high school education or higher. With the improvement of education level, the proportion of physical exercise is increasing distinctly. Singles and unemployed people are more active than those who are in marriage and employed. People who never drinks was more likely to take part in physical exercise.

Multivariate Logistic regression analysis

To explore our hypothesis and test the effects of health behaviors and awareness on physical exercise, we controlled for demographic variables and gradually added health behaviors and health awareness variables to the model, as shown in table 3. The consequence revealed that health behaviors and health awareness remained robust in all models. The worse their behavior and health awareness, the less likely they were to engage in exercise. Additionally, Socio-demographic variables(age groups, household register, marital status, educational level, employment status, prefecture-levels) were still highly important factors related to physical exercise.

Table 1 Physical exercise amount of Tibetan residents aged 15 to 65 in 2018

Amount of exercise	Categories	Number	(%)
Frequency(Times per week)	6~	1608	17.0
	3~5	777	8.2
	1~2	1042	11.0
	0	405	4.3
Time(Minutes per time)	1~30	2067	21.9
	31~60	984	10.4
	61~90	115	1.2
	91~120	412	4.4
	121~	254	2.7
Frequency	Frequently	1047	11.1
	Sometimes	1412	15.0
	Occasionally	1373	14.6
	Never	5604	59.4

Table 2 Characteristics of physical exercise of Tibetan residents aged 15 to 65 in 2018

Characteristics	Total Physical activity n(%)		χ^2	P-value	Crude OR
Social demographic variables					
Sex					
Male	4492	1780(39.6)	3.445	0.063	1
Female	4944	2052(41.5)			0.925
Age groups					
15~24	1091	548(50.2)	140.144	0.001	1
25~34	2206	793(35.9)			1.798
35~44	2204	746(33.8)			1.972
45~54	2348	985(42.0)			1.396
55~65	1587	760(47.9)			1.098
Household register					
Agricultural and pastoral areas	7466	2565(34.4)	580.207	0.001	1
City	1963	1262(64.3)			0.291
Others	7	5(71.4)			0.209
Ethnic groups					
Han	228	123(53.9)	24.095	0.001	1
Tibetan	9142	3672(40.2)			1.745
Others	66	37(56.1)			0.918
Marital status					
In marriage	7296	2774(38.0)	89.449	0.001	1
Not in marriage	2140	1058(49.4)			0.627
Educational level					
illiteracy	4261	1431(33.6)	457.218	0.001	1
Primary school	3243	1279(39.4)			0.776
Junior high school	1205	590(49.0)			0.527
High school includes technical schools	394	264(67.0)			0.249
College degree and above	333	268(80.5)			0.123
Employment status					
Employed	7871	2813(35.7)	466.988	0.001	1
Unemployed	1565	1019(65.1)			0.298
Prefecture-levels					
Lhasa	2524	1824(72.3)	1856.184	0.001	1
Xigaze	2040	375(18.4)			11.569
Shannan	876	190(21.7)			9.408
Nyingchi	590	231(39.2)			4.050
Qamdo	1774	505(28.5)			6.548
Naqu	1210	629(52.0)			2.407
Ali	422	78(18.5)			11.492
Health behaviors					
Smoking					
Yes	1290	497(38.5)	2.842	0.241	1
Smoking cessation	311	124(39.9)			0.945
Never	7835	3211(41.0)			0.903
Drinking					
Drink within 30 days	2018	498(24.7)	278.217	0.001	1

Drink before 30 days	560	220(39.3)		0.506
Never	6858	3114(45.4)		0.394
Health consciousness				
Health record				
Yes	5992	2647(44.2)	138.035	0.001 1
No	1027	448(43.6)		1.023
Don't know	2417	737(30.5)		1.804
Physical examination				
Yes	6388	2825(44.2)	107.042	0.001 1
No	3048	1007(33.0)		1.607

Table 3 Logistic multivariate analysis of physical exercise frequency of Tibetan residents aged 15 to 65 in 2018

Characteristics	Block 1		Block 2		Block 3		Block 4	
	OR(95%CI)	<i>P</i>	OR(95%CI)	<i>P</i>	OR(95%CI)	<i>P</i>	OR(95%CI)	<i>P</i>
Age groups								
15~24								
25~34	0.964(0.799,1.163)	0.698	0.971(0.804,1.171)	0.756	0.971(0.804,1.173)	0.764	0.965(0.799,1.166)	0.715
35~44	1.072(0.879,1.306)	0.495	1.083(0.888,1.321)	0.432	1.092(0.894,1.332)	0.389	1.076(0.881,1.314)	0.471
45~54	1.480(1.215,1.801)	0.000	1.505(1.235,1.834)	0.000	1.524(1.250,1.859)	0.000	1.497(1.228,1.826)	0.000
55~65	1.897(1.541,2.334)	0.000	1.925(1.563,2.371)	0.000	1.930(1.566,2.379)	0.000	1.894(1.536,2.335)	0.000
Household registers ¹								
Agricultural and pastoral areas								
City	1.609(1.410,1.836)	0.000	1.601(1.404,1.827)	0.000	1.783(1.557,2.041)	0.000	1.778(1.553,2.036)	0.000
Marital status								
In marriage								
Not in marriage	1.260(1.113,1.427)	0.000	1.259(1.112,1.425)	0.000	1.259(1.112,1.427)	0.000	1.268(1.119,1.437)	0.000
Educational level								
illiteracy								
Primary school	1.336(1.194,1.495)	0.000	1.338(1.196,1.497)	0.000	1.332(1.190,1.491)	0.000	1.323(1.181,1.481)	0.000
Junior high school	2.025(1.714,2.392)	0.000	2.037(1.724,2.406)	0.000	2.039(1.726,2.410)	0.000	2.033(1.720,2.404)	0.000
High school includes technical schools	3.317(2.402,4.098)	0.000	3.170(2.426,4.142)	0.000	3.251(2.487,4.249)	0.000	3.192(2.440,4.175)	0.000
College degree and above	4.747(3.427,6.577)	0.000	4.787(3.455,6.633)	0.000	4.683(3.384,6.482)	0.000	4.589(3.315,6.353)	0.000
Employment status								
Employed								
Unemployed	1.900(1.654,2.182)	0.000	1.884(1.640,2.165)	0.000	1.911(1.663,2.196)	0.000	1.911(1.663,2.197)	0.000
Prefecture-levels								
Lhasa								
Xigaze	0.120(0.103,0.140)	0.000	0.130(0.110,0.153)	0.000	0.158(0.133,0.189)	0.000	0.166(0.139,0.198)	0.000
Shannan	0.156(0.128,0.189)	0.000	0.157(0.129,0.191)	0.000	0.160(0.132,0.195)	0.000	0.159(0.131,0.194)	0.000
Nyingchi	0.322(0.264,0.393)	0.000	0.327(0.268,0.399)	0.000	0.401(0.326,0.494)	0.000	0.445(0.360,0.550)	0.000
Qamdo	0.227(0.196,0.263)	0.000	0.226(0.195,0.262)	0.000	0.222(0.191,0.258)	0.000	0.243(0.208,0.283)	0.000
Naqu	0.662(0.566,0.775)	0.000	0.656(0.560,0.768)	0.000	0.839(0.706,0.996)	0.044	0.999(0.829,1.205)	0.993
Ali	0.090(0.069,0.119)	0.000	0.091(0.069,0.120)	0.000	0.131(0.098,0.176)	0.000	0.149(0.111,0.201)	0.000
Smoking								
Yes								
No	1.301(1.127,1.502)	0.000	1.264(1.092,1.462)	0.002	1.251(1.081,1.448)	0.000	1.239(1.070,1.434)	0.004
Drinking								

Yes									
No				1.160(1.019,1.320)	0.025	1.173(1.030,1.337)	0.016	1.172(1.029,1.335)	0.017
Health record									
Yes									
No						0.712(0.601,0.844)	0.000	0.746(0.629,0.885)	0.001
Don't know						0.574(0.500,0.650)	0.000	0.585(0.510,0.672)	0.000
Physical examination									
Yes									
No								0.753(0.669,0.848)	0.000
Constant	0.745	0.025	0.667	0.004	0.693	0.009	0.724	0.022	

Discussion

The study revealed that the estimate of physical exercise of residents in Tibet was 40.6%, more than half of them were lack of physical exercise(59.4%), which is lower than the results of The Fifth National Health Service Survey on the population aged 15 and above in 2013 (72.2%)[18]. Of those, 11.1% were sufficiently active. Ultimately, after excluding possible influencing factors, the level of physical exercise varies comparatively on the basis of age, household registration, marital status, education level, employment status, prefecture-levels, smoking, drinking, health record, and physical examination.

There were few previous reports on physical activity in Tibet. Hence, this consequence was quite diverse from the great mass of other regions of China. The proportion of physical inactivity were reported to be 50.8%, 57.6%, and 43.4% in coastal provinces as Hebei[14], Shandong[15] and Zhejiang[16] respectively. They are lower than 59.4% reported in this paper, especially in Hebei and Zhejiang, potentially indicates that higher elevations and less economically developed areas have lower rates of physical activity. Besides, globally, in the STEPs surveys undertaken in Africa, Kenya (7.7%)[19], Uganda (4.3%)[12] and Malawi (9.5%)[13] have low rates of physical inactivity, but extraordinary high in Ghana (85.7%) and Mauritania (50.7%)[13]. Primarily, the first three countries are at relatively high altitudes, while the last two are lower, averaging less than 1,000 meters. Then it turns out that exercise is more common at high altitudes. This phenomenon is inconsistent with the results of domestic studies. According to the analysis, the average altitude of Kenya and other areas has not reached 4,000 meters. In fact, there were few reports on physical exercise in areas around 4,000 meters above sea level, and high altitude may indeed affect residents' physical exercise. In addition, people in Tibetan areas have a strong sense of religion and have independent exercise methods, such as turning the scriptures and making pilgrimages, which are not included in the duration of physical exercise, thus underestimating the prevalence of physical exercise. There were also research stated in the United States[20], Mexico[21] and Brazil[22], those American countries got physical inactivity ratio as 11.1%, 19.4% and 45.6%. In terms of economic development and national income, the result seems reasonable: the more developed the economy, the

higher the rate of physical activity. We can find that there were great discrepancies in physical exercise levels in different altitude, geography and economy. Another plausible reason for the discrepancy may be the distinction of measurement tools[23], variation in the physical activity was classified[21], and the different population and races.

Likewise, we observed that there is a big gap between the level of physical exercise in Lhasa and other regions. The provincial capital Lhasa has the highest rate of physical exercise at 72.3%. Lhasa enjoys rapid economic development, relatively convenient transportation and higher education level than other regions, so it has a higher popularity of physical exercise.

The educational level of Tibetan residents is generally low. Although the situation has been improving rapidly in recent years, the analysis results show that the uneducated still held a large proportion (45.2%), while the high school and above educated only account for 7.7%. The rate of physical exercise increases with the growth of educational level distinctly. This is the same as the results of some domestic studies[24, 25]. According to William[26], people with a high level of education, both in terms of knowledge and resources, are more likely to participate in physical exercise. Studies have shown that the overall health literacy of Tibetan residents is lower than that of other regions[27]. We can speculate that the factor of educational level was seriously affected the health awareness of Tibetan residents, thus reducing their attention to physical exercise.

Education affects their health awareness as well as their behavior, while people with a high sense of health, such as having a health registration or taking a physical examination, are more physically active. Enhancing their education as well as health awareness will be of great help to their health. In Tibet, smoking and drinking are common phenomena[28, 29], the multivariate Logistic regression analysis shows that people with bad living habits are less likely to take exercise. In the same way, bad behavior is always accompanied by bad behavior, what we must do is to make them aware of the harm of bad habits to their health in the first place.

In a certain period of time, sports population represents the level of economic development of a country or region[30], and also reflects the development level of public health undertakings in a region. Due to its special geographical location and environment, the proportion of sports population in Tibet is comparatively low. In order to improve the physical exercise behavior of Tibetan residents, it is necessary to strengthen the consciousness of the residents to keep fit, and then improve the effect of physical exercise through scientific and systematic education. Taken all together, these findings underscored the importance of implementing relevant policies and programs in Tibet to comprehensively promote the level of physical activity in the population, thus increase the physical health of Tibetan people.

The study also had some limitations. In the health service survey, physical exercise data were self-reported by the interviewees. Due to race, language, education, age, health status and other factors, the validity of self-report may have some bias. We try our best to control the quality of the questionnaire in the aspects of questionnaire filling and inspection after collection, hoping that the results are the closest to the truth.

Conclusions

This study reports the physical exercise of people living above an average altitude of 4000 meters, and drew a certain conclusion that Tibetan people are the key intervention group for physical exercise. The groups at higher risk were those aged between 25 to 54 years old, city resident, not in marriage, nor in employment, and who were illiteracy and have bad living habits. It is extremely urgent to improve residents' health awareness and promote their physical exercise. This article provides information for health policy makers to develop measures.

Abbreviations

NCDs: Non-communicable diseases

PPS: Probability proportionate to size sampling

WHO: World Health Organization

ORs: Odds ratio

CIs: Confidence interval

Declarations

Ethics approval and consent to participate

The national bureau of statistics approved the implementation of the Sixth National Health Service Statistical Survey. National Health and Family Planning Commission of the People's Republic of China and Health and Family Planning Commission of Tibet autonomous region issued the notice for approval [see Additional file 1-2]. Local health research projects that meet ethical requirements can be carried out with the approval of the two departments. The Medical Ethics Expert Committee of the National Health and Family Planning Commission of the People's Republic of China is a legal ethical review institution in China. Since most of the subjects in this study are Tibetan residents with a low educational level and a large sample size, the researcher adopted the method of oral informed consent. The investigator informed the respondents of the purpose of the survey in accordance with the prepared informed consent [see Additional file 3]. Prior to the survey, the respondents obtained the oral consent of the residents, and the minors (minors are considered anyone under the age of 16) participated with the consent of their parents/guardians. All the participants are Chinese and they live in China.

Consent for publication

Not applicable.

Availability of data and material

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

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LQW mainly conducted single-factor analysis of physical exercise data, LQW and WY were major contributors in writing the manuscript, and LQW, WY, WGH, LJQ and DRD conducted multi-factor analysis and explanation of the data. All authors read and approved the final manuscript.

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