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# Socioeconomic inequalities of hypercholesterolemia in Kurdistan Province, Iran, in 2005

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**Health Care System**

## Abstract

**BACKGROUND:** Hypercholesterolemia is one of the main risk factors for many non-communicable diseases (NCDs). Many deaths caused by hypercholesterolemia usually occur in low and middle income countries. The aim of the present study was to determine the socioeconomic inequality in the distribution of hypercholesterolemia in Kurdistan Province, Iran, in 2005.

**METHODS:** The data used in this study were obtained from the results of the Non-Communicable Disease Surveillance Survey (NCDSS) conducted in 2005 in Kurdistan Province. In this study, the socioeconomic status (SES) of participants was determined based on their assets and residential location and using the principal component analysis (PCA) statistical method. The levels of inequality in 5 different socioeconomic groups were determined by calculating the concentration index, comparing odds ratio (OR), and through using logistic regression method.

**RESULTS:** The prevalence of hypercholesterolemia in the studied subjects was 38.5% [confidence interval (95% CI): 36, 41]. The concentration index of hypercholesterolemia was -0.031 (95% CI: -0.070, 0.009). Moreover, the OR of hypercholesterolemia in the richest group, compared with the poorest, was 0.82 (0.59 to -1.13).

**CONCLUSION:** In this study, the relationship between socioeconomic status and risk of hypercholesterolemia was not statistically significant; however, usually, SES is associated with hypercholesterolemia. In the comparison of different countries, distribution of hypercholesterolemia in different SES levels depends on the level of development, gross national product (GNP) per capita, and level of income in each country. Inequalities in the distribution of risk factors for hypercholesterolemia can be reduced through increasing disadvantaged groups' access to health care services and planning special programs for inequality reduction.

**KEYWORDS:** Inequality, Hypercholesterolemia, Socioeconomic status, Iran

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## Introduction

Hypercholesterolemia is one of the main risk factors for non-communicable diseases (NCDs). The majority of deaths from hypercholesterolemia usually occur in low and middle income countries.[1,2] Hyperlipidemia is a collection of heterogeneous disorders, which are caused due to a buildup of cholesterol or an increase in triglycerides. It is classified into two categories of hereditary and non-hereditary. The non-hereditary type is usually a secondary complication caused by reasons such as diet, alcohol consumption, estrogen therapy, and diseases such as diabetes mellitus, hypothyroidism, and nephritis.[3]

Dyslipidemia plays a major role in the development of atherosclerosis. Reduction of plasma lipid concentration plays an important role in reducing the incidence of cardiovascular disease.[4] Increased level of cholesterol is an

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important risk factor for metabolic syndrome. About a quarter of the world's population are suffering from this syndrome. People with the syndrome are at a five times higher risk of diseases such as diabetes and are at a higher risk of cardiovascular diseases.[5] Increased consumption of fatty foods raises the cholesterol level, which in turn adds to the risk of diseases caused by hypercholesterolemia.[6]

Determining the distribution of health outcomes among subgroups can help to improve equity in health. Today, the issue of equity in health is accepted as a moral principle and a fundamental right of individuals. Accordingly, all people, regardless of their socioeconomic status (SES), should have access to an acceptable level of health.[7]

This perspective has been strengthened and highlighted in recent years. For more than a decade, experts and international organizations, such as the World Health Organization (WHO), have recommended efforts to better understand the health status of communities. The determination of not only the level of health indicators, but also the distribution of health outcomes is necessary in different subgroups. The focus on health inequalities in recent years has resulted in a greater emphasis on the determination of inequalities in health indices. Accordingly, this subject has become very popular and many health and management professionals, sociologists, and epidemiologists have paid special attention to it. For the same reasons, the measurement of inequalities in health status and determination of the role of SES in health have received much attention in recent years. Although some countries have followed the recommendation about the determination of health inequalities in health outcomes, many countries still have not taken any action in this field.[8-10]

Measurement of changes in health inequality indices not only helps to determine the SES of each sub-group at each stage over time, but also can determine the effects of social changes and policies designed to reduce inequality. In fact, if our aim is to provide equity in health, we should be able to measure the impact of our activities over time.[11]

From an applied perspective, determining the level of inequality in risk factors for NCDs, such as hypercholesterolemia, can help authorities adopt appropriate policies to improve social equity in community health. Additionally, it can direct interventions so that by using fewer resources a larger number of NCDs can be controlled in the community. The results of this study can help policymakers to incorporate some objectives in health programs to reduce inequalities and ensure equity in health. Hence, the aim of the present study was to determine socioeconomic inequality in the distribution of hypercholesterolemia in Kurdistan Province, Iran, in 2005.

## Materials and Methods

This was a cross-sectional population-based study, which was conducted via a descriptive and analytical method. The data used in this study were obtained from the results of the Non-Communicable Disease Surveillance Survey (NCDSS) collected in 2005 in Kurdistan Province. Data were collected using a questionnaire and based on a stepwise guide published by the WHO.[12]

The studied population consisted of residents of Kurdistan Province aged 15 to 64 years. A total of 2494 individuals participated in this study. The sampling frame consisted of all households in Kurdistan Province. The sampling frame (i.e., household) was defined as the number of people who were living together in a residence and had common expenditures.

In this study, we used cluster sampling method; moreover, we used one-step random clustering method for different clusters. In addition, postal code was determined as the sampling framework. To set up each cluster, the core members of each cluster were selected based on their 10-digit postal code. In every city,

a cluster consisted of one or more blocks or parts of a block. Blocks were usually formed by a series of interlocking buildings that were limited to an alley or a street, boulevard, square, market, police station, mountain, river, or wasteland. First, the core member of each cluster (i.e., a household) was determined, and then, researchers started their survey from the first household and moved toward the right neighborhood. Using C index and C curve, the level of inequality was calculated. The concentration index values range between -1 and 1. This is interpreted as follows: if the curve is above the equality line, the concentration index ranges between 0 and -1 and it indicates the distribution of risk factor among poor individuals. On the contrary, if the curve is below the equality line, the concentration index ranges between 0 and 1 which indicates the distribution of risk factors among the rich individuals.[13,14] Using the principal component analysis (PCA), participants' SES was determined based on their assets and residential location. In this study, in addition to the concentration index, logistic regression and odds ratio (OR) were also used to determine socioeconomic inequalities between different groups. The poorest socioeconomic group was selected as the base group, and other groups were compared with that base group. To determine the contribution of each determinant to inequality, decomposition analysis was used.[15-17] All analyses were carried out in STATA (version 10, StataCorp LP, College Station, TX, USA) and SPSS software (version 15, SPSS Inc., Chicago, IL, USA).

## Results

A total of 2494 patients were recruited in the present study in 2005. The response rate was 99.8%. The mean age of participants was 39.08 ± 14.37. Table 1 shows the distribution of the subjects in the 5 socioeconomic groups. Based on PCA, an asset index was calculated for each individual. On the basis of this index, the subjects were classified into quintiles, from the poorest groups to the richest group.

Based on the results of PCA, 2491 individuals were classified into five SES groups (quintiles). Accordingly, 758 individuals (30.43%) were placed in the first quintile or the poorest group, 489 individuals (19.63%) in the second quintile or the poor group, 455 individuals (18.27%) in the third quintile or the moderate group, 379 individuals (15.21%) in the fourth quintile or the rich group, and 410 individuals (16.46%) in the fifth quintile or the richest group.

The prevalence of hypercholesterolemia was 38.5%. Table 2 shows the distribution of hypercholesterolemia in different SES quintiles, which were classified based on the PCA method. In this table, the first quintile is the poorest group and the fifth quintile is the richest group. To calculate OR, the first quintile was considered as the base group, and OR of other groups was calculated based on a comparison with this group, which was the poorest group. The OR of hypercholesterolemia in the richest group to the poorest group was 0.82 (0.59 to 1.13).

The information presented in table 2 is based on the OR of each group to the poorest group; it shows inequality and its concentration index.

**Table 1. Distribution of the subjects in the five socioeconomic status (SES) groups in the study conducted in 2005**

| Socioeconomic group | Frequency | Percentage |
|---|---|---|
| First quintile or the poorest group | 758 | 30.43 |
| Second quintile or the poor group | 489 | 19.63 |
| Third quintile or the moderate group | 455 | 18.27 |
| Fourth quintile or the rich group | 379 | 15.21 |
| Fifth quintile or the richest group | 410 | 16.46 |
| Total | 2491 | 100 |

**Table 2. Distribution of hypercholesterolemia in different socioeconomic status (SES) quintiles in Kurdistan in 2005**

| Risk factor | Variable | First group (the poorest group) | Second group (poor group) | Third group (moderate group) | Fourth group (rich group) | Fifth group (the richest group) |
|---|---|---|---|---|---|---|
| Hypercholesterolemia | n of each group/total n | 297/674 | 181/400 | 139/334 | 83/214 | 104/268 |
| | OR | 1 | 0.99 | 0.82 | 0.79 | 0.82 |
| | CI | - | (0.76-1.31) | (0.61-1.10) | (0.55-1.12) | (0.59-1.13) |

OR: Odds ratio; CI: Confidence interval

The concentration index [C Index & confidence interval (CI 95%) for C Index] of hypercholesterolemia in Kurdistan Province in 2005 was -0.031 (CI: -0.009, -0.070). The negative concentration index indicates the higher distribution of this risk factor among the poorer groups and the positive values indicate the distribution of the risk factor among richer socioeconomic groups. According to this table, the concentration index of hypercholesterolemia in the community is not significant. There is no significant inequality in the distribution of this risk factor in the community.

The concentration index for hypercholesterolemia had gone above the equality line in the same time period and was directed toward inequality among poorer groups. This indicates that, with a slight difference, inequality was not significant

## Discussion

The results of our study on inequality in hypercholesterolemia are consistent with the results of some previous studies. In our study, the concentration index (C Index & CI 95% for C Index) of hypercholesterolemia was -0.031 with CI ranging between -0.070 and 0.009; this indicates that, with a slight difference, inequality was not significant. This can be interpreted by the texts available in the literature. However, this result may be due to the small sample size and with an increase in sample size it might become significant. The distribution of hypercholesterolemia in different socioeconomic groups depends on the development of the country, gross national product (GNP) per capita, and time.

The prevalence of hypercholesterolemia in the United States, which is a developed country, has declined from 1971 to 2002. During this period, people who were of higher SES had been more successful in decreasing their cholesterol; consequently, the inequality distribution had shifted and hypercholesterolemia had become more prevalent among poorer people.[18]

In the present study, hypercholesterolemia was less observed in people who were more affluent; however, with a slight difference, it was not statistically significant. This finding highlights the fact that inequality in the distribution of hypercholesterolemia in different SES groups depends on the development status, age group, access to health services, and some others factors. People living in lower socioeconomic classes, for instance those who have lower income, have less access to health care services; therefore, their cholesterol levels are controlled much later than those who are in higher socioeconomic classes.[19]

The prevalence of hypercholesterolemia was 38.5% in 2005. This illustrates the fact that low SES may lead to an unhealthy diet, which in turn increases the prevalence of hypercholesterolemia. With improvement in SES and changes in diet, the prevalence of hypercholesterolemia decreases significantly.[20,21] This study revealed a high

incidence of hypercholesterolemia, and based on previous studies, increase in hypercholesterolemia can lead to an increase in the risk of many diseases, including cardiovascular disease.[22]

In this study, while dividing people into different quintiles, many people were classified in the poor group. In communities with lower SES, there is higher potential for some risk factors, including hypercholesterolemia, diabetes, and high blood pressure, these risk factors, in turn, can increase the mortality rate. Such a phenomenon indicates the presence of socioeconomic inequalities.[23]

Different determinants, such as education, work environment, income, and social factors, are associated with various diseases including hypercholesterolemia; they can subsequently increase the risk of cardiovascular diseases.[22]

Although in this study the relationship between SES and risk of hypercholesterolemia, with slight difference, was not significant, SES is usually associated with hypercholesterolemia. If this relationship is neglected, it will not be possible to design appropriate interventions to control the risk factors. Because of the nature of the risk factors, some of them are more prevalent among groups of higher SES; however, most of them are more common in low socioeconomic groups. This may be due to their lack of access to health services to prevent and control different diseases. Accordingly, the rate of certain diseases, including hypercholesterolemia, may increase. Thus, reducing poverty, improving education, paying attention to poorer groups in health policies, increasing disadvantaged groups' access to health services, and designing special programs for this issue can decrease socioeconomic inequalities in the distribution of risk factors.

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## Conflict of Interests

Authors have no conflict of interests.

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