

Abstract

# Cost of Diabetes in Saudi Arabia

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## Abstract

**Background:** The Kingdom of Saudi Arabia (KSA) has made tremendous improvements in its health system in a short period of time due to extensive investments from oil revenues. In 2015, the Saudi Ministry of Health (MOH) housed 250,000 personnel, including 31,516 physicians and 75,978 nurses, and operated 249 hospitals with 34,000 beds. It is responsible for 60% of healthcare services, with the remaining 40% managed by a number of semi-public organizations and the private sector. The MOH is in charge of health promotion, disease prevention, and treatment. Health care services are provided for free throughout the country. In recent years and with improvements in infrastructure and health services, an increasing burden of non-communicable diseases is emerging. We recently reported high rates of diabetes mellitus.

**Objective:** Diabetes mellitus is a major burden in the Kingdom of Saudi Arabia (KSA). We estimated the direct cost of diabetes in KSA and the future cost accounting for currently undiagnosed and borderline diabetics. **Methods:** We used a bottom-up approach to determine the direct cost of diabetes mellitus in KSA at the population level using Saudi Ministry of Health (MOH) cost data for medications, health visits, laboratories, and hospitals.

**Methods:** KSA MOH, developed a database of available published and unpublished data sources to generate the burden of disease for KSA. Key inputs into this database included systematic reviews of the literature, analysis of household survey data, antenatal clinic surveillance, reportable disease notifications, disease registries, hospital admissions data, outpatient visit data, population-based cancer registries, active screening data, and other administrative data. Moreover, the MOH provided detailed data on the prices of medications, laboratory testing, medical procedures, and clinic and hospital visits and stays. We assumed that the MOH cost estimates apply to the population served by the private sector and other governmental health agencies such as the armed forces or the National Guard. Blood samples were collected at local health clinics and analyzed in a central lab at the King Fahd Medical City in Riyadh. COBAS INTEGRA400 plus was used to measure blood levels of HbA1c, or glycated hemoglobin. A Roche Hitachi COBAS 8000 system was used to measure cholesterol. Respondents were considered to be diabetic if they met any of the following criteria: 1) measured HbA1c equals or exceeds 6.5% (48.5 mmol/mol), or 2) measured HbA1c does not equal or exceed 6.5% (48.5 mmol/mol), but the respondent reported taking medications for diabetes. Respondents were considered to be have borderline diabetes (glucose intolerant) if: 1) they did not report taking drugs for diabetes, and 2) their measured HbA1c blood level was greater than 5.7% (35.3 mmol/mol) and less than 6.5% (48.5 mmol/mol). Women were asked if they were diagnosed with diabetes during pregnancy. Respondents were considered hypercholesterolemic if they met any of the following criteria: (1) measured cholesterol equal to or exceeding 6.2 mmol/L or measured cholesterol not exceeding 6.2 mmol/L, but the respondent reported taking medications for hypercholesterolemia.

**Results:** Overall, 1,095,776 (8.5%) Saudis reported being diagnosed with diabetes. However, a total of 1,745,532 (13.4%) Saudis aged 15 years or older had diabetes. This total group is the sum of measured diabetes (1,193,075, 68.4%) and those who were currently on diabetes medication with controlled levels of HbA1c (552,457, 31.6%). Among those that our survey identified as diabetic from blood tests, 43.6% were undiagnosed. Moreover, 15.2% of Saudis, or 979,953, had borderline diabetes. the total cost of diabetes in KSA. The cost currently is at 17 billion Riyals. If those who are undiagnosed joined the treatment pool, the cost would increase to 27 billion Riyals. If those with glucose intolerance (pre-diabetes) progressed at the current observed rate, the total cost would be 43 billion Riyals.

**Conclusions:** Our study calls for immediate action to reduce the burden of diabetes and non-communicable diseases (NCD). A national plan to prevent and control the rising burden of chronic diseases should be developed and implemented. We previously reported that Saudis do not seek preventive care. Hence, it is crucial that the programs involve community engagement and early screening. Campaigns to educate the public about the disease should be a priority. The campaigns should include information on the risk factors for diabetes and gestational diabetes. the total cost of diabetes in KSA. The cost currently is at 17 billion Riyals.

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