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Triggering Factors of Primary Care Costs in the Years Following Type 2 Diabetes Diagnosis in Mexico

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Background and Aims. Diabetes represents a high epidemiological and economic burden worldwide. The cost of diabetes care increases slowly during early years, but it accelerates once chronic complications set in. There is evidence that adequate control may delay the onset of complications. Management of diabetes falls almost exclusively into primary care services until chronic complications appear. Therefore, primary care is strategic for reducing the expedited growth of costs. The objective of this study was to identify predictors of primary care costs in patients without complications in the years following diabetes diagnosis.

Methods. Direct medical costs for primary care were determined from the perspective of public health services provider. Information was obtained from medical records of 764 patients. Microcosting and average cost techniques were combined. A generalized linear regression model was developed including characteristics of patients and facilities. Primary health care costs for different patient profiles were estimated.

Results. The mean annual primary care cost was USD$465.1. Gender was the most important predictor followed by weight status, insulin use, respiratoty infections, glycemic control and dyslipidemia. A gap in costs was observed between genders; women make greater use of resources (42.1% on average). Such differences are reduced with obesity (18.1%), overweight (22.8%), respiratory infection (20.8%) and age >80 years (26.8%). Improving glycemic control shows increasing costs but at decreasing rates.

Conclusions. Modifiable factors (glycemic control, weight status and comorbidities) drive primary care costs the first 10 years. Those factors had a larger effect in costs for males than in for females.

Key Words: Type 2 diabetes, Resource use, Primary care, Direct costs, Predictors.

Introduction

Diabetes represents a heavy epidemiological and economic burden worldwide. In 2010, the world prevalence of diabetes was estimated at 6.4% (1); however, in Mexico the prevalence is 14.42% (2).

Diabetes causes a significant economic load for both health systems and society.

Management of patients with diabetes falls almost exclusively into primary care services until chronic complications set in (3). Then, specialized care services share the responsibility for the care of the patient. A similar pattern is observed in Mexico (4).

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The Instituto Mexicano del Seguro Social (IMSS) is the largest Social Security Institution in Mexico and cares for >40% of population (5). The IMSS is financed by prepaid quotes estimated according to the salary level and comes from the federal government, employers and employees. The IMSS health care system is three-tiered: the first level is the family medicine system (primary care), the second level comprises general hospitals and the third level provides care for complex medical problems. Primary care is the first contact of individuals to the institutional health care system. There are three main types of primary care facilities: small-, medium- and large-capacity facilities. The small-size facility includes 1−15 family physican offices and social work counselors. Medium and large facilities include 15−30 family physician offices and >30 family physician offices, respectively, and also auxiliary services (laboratory and x-ray), odontological and emergency areas (6). Clinical guidelines for diabetes management are available there (7) and health personnel receive periodic training.

In high-income countries, ~60% of the medical expenses for diabetes is attributed to outpatient care (8). At IMSS, 75% of the medical expenses for diabetes are directed at primary care, 15% to hospitalizations and 10% to drug treatments (9).

The cost of diabetes care increases slowly in the early years but accelerates once chronic complications appear (10). There is evidence that adequate control of diabetes may delay the onset of complications (11). Therefore, primary care in the years following diagnosis is strategic for reducing the expedited growth of health care costs.

Based on the study of Eastman (12), it is estimated that 29.4% of patients will develop complications 10 years from the time of diagnosis. In Mexico, a study carried out in a primary care facility, reported that the lapse between diagnosis and onset of chronic complications was 8.4 years for ischemic heart disease; meanwhile, lapse for all other diseases was 11 years. The complication with the maximum prevalence was neuropathy (34.4%) (13). Therefore, a lapse of 10 years from diagnosis seems adequate to analyze the disease before complications arise and trigger costs.

Even with its relevance, few studies focus on costs of primary care or outpatient care (14−18); however, they include a complex case mix of diabetes complications. Also, studies reporting costs in the years following a diabetes diagnosis (19−22) include this complex case mix. Fewer studies focus on the group of patients without chronic complications (23). Due to the individual magnitude of costs of complications care, analysis of cost before onset of complications has been downplayed. The same trend happens with studies on the determinants of diabetes costs. Which include all the case mix of diabetes complications (24,25). Determinants of costs before onset of complications have received insufficient attention.

Therefore, the main objective of this study is to evaluate the main predictors of primary health care costs for patients with diabetes in the years following diagnosis, before the onset of disease complications.

Materials and Methods

We conducted an observational study, which was a secondary analysis of data from a program evaluation of primary care. The information corresponds to patients attending primary care facilities at the IMSS. We studied four primary care facilities from two of the largest cities: Mexico City and Monterrey, a medium-size and a large-size facility were selected from each city.

Patients were selected by non-random sampling by quota, with diabetes diagnosed for ≤10 years. Patients with vascular disease, neuropathy, nephropathy, diabetic foot or retinopathy were excluded as well as those without at least one blood glucose measurement in their clinical records for the period analyzed.

The sample size estimated was 832 (26)with a 95% confidence level, non-response rate of 15%, and a standard deviation of USD50 (27). The sample was proportionally distributed according to the size of the facilities.

Direct medical costs were determined from the perspective of the public health services provider (28). The framework period was 6 months for two cross-sectional samples taken during the second semesters of the years 2003 and 2004. Resource utilization was obtained from the medical record and included family doctor and emergency room visits, laboratory and x-ray tests, and drug prescriptions. Microcosting was used to calculate semestral cost of drug prescriptions applying institutional drug prices (*Reference prices to purchase capital inputs of the Instituto Mexicano del Seguro Social*, not publicly available). Average prices were applied to the other services corresponding to *average cost of services* for the year 2011 (29).

Costs were annualized, actualized by inflation (7.68% for 2011−2013) (available from: http://www.banxico.org.mx/portal-inflacion/) and presented in U.S. dollars (at an exchange rate of 13.0843 pesos/dollar, available from:http://www.banxico.org.mx/portal-mercado-cambiario/index.html). No discount rate was used.

Estimation of Predictors of Primary Care Costs

For the descriptive analysis, Pearson's χ^2, Fisher's exact test, Mann-Whitney, and Student *t* tests were used (30). Generalized linear regression model (GLM) for primary health care costs was carried out because costs present an asymmetrical distribution, non-negative values and often heteroscedasticity. Combinations of families and linking functions were evaluated and the final model was chosen in terms of the U-Theil test and the Akaike information criteria (31).

The model included characteristics of patients as well as of facilities. Patient variables included gender (dichotomic); age and years since diagnosis of diabetes (continuous); body mass index (BMI) (categorical variable: normal: BMI<25,