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Evaluation of hospitalization costs for diabetic pregnant women in a University Hospital in the interior of São Paulo State

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ABSTRACT. This study aimed at identifying the hospitalization costs of pregnant women with Diabetes Mellitus (DM) at a University Hospital. It is an observational, quantitative study with descriptive data analysis. The direct and indirect costs available in the institution were identified in order to determine the hospitalization costs for patients diagnosed with DM during pregnancy and childbirth. By means of descriptive statistics, it was observed that 63.46% of the patients had caesarean delivery; the mean total cost was R$ 362.93 (U$ 218.10)/hospitalization during pregnancy, R$ 2,642.65 (U$ 1,588.13)/hospitalization for caesarean delivery, and R$ 2.319.77 (U$ 1,394.09)/hospitalization for vaginal delivery. It was concluded that the analysis of hospitalization costs for patients with DM is of utmost importance, since they are high-complexity hospitalizations that require a large number of interventions, increasing thus the service costs.

Keywords: costs, cost analysis, hospital costs, pregnancy in diabetic women, nursing.

Avaliação de custos das internações de gestantes diabéticas de um Hospital Universitário do interior de São Paulo

RESUMO. O trabalho teve como objetivo identificar os custos das internações de gestantes portadoras de Diabetes *Mellitus* (DM) de um Hospital Universitário. Trata-se de um estudo observacional, quantitativo com análise descritiva dos dados. Foram identificados os custos diretos e indiretos disponíveis na instituição para a determinação dos custos das internações de pacientes com diagnóstico de DM durante a gestação e no parto. Por meio de análise estatística descritiva, verificou-se que 63,46% das pacientes realizaram parto cesárea; o custo médio total foi de R$ 362,93/internação durante a gestação, R$2642,65/internação para o parto cesárea e R$2319,77/internação para o parto vaginal. Conclui-se que é extremamente importante a realização da análise dos custos das internações de pacientes com DM, pois são internações de alto risco, que requerem grande número de intervenções, aumentando os custos do serviço.

Palavras-chave: custos, análise de custo, custos hospitalares, gravidez em diabéticas, enfermagem.

Introduction

Increasingly the health service costs have generated concerns in order to seek mechanisms to control expenditures for maintenance and investments in technology.

Cost evaluation is an extremely important working tool to optimize hospital management (CAVASSINI et al., 2010).

Cost can be defined as the evaluation of goods and services to be produced, purchased, or consumed by a company or institution (LEONE, 1981).

According to Castilho et al. (2005) and Asevedo and Koch (2004), the cost is the sum of spending with personnel, material, physical structure and equipment, and should be understood as a powerful management tool, used for analysis of performance, productivity and quality of the services.

Several factors may increase the costs on health such as: price quotation, amount of purchase, institution size, complexity of treatments, hospital stay length, absence of protocol, awareness, and of capacity of health professionals (CASTILHO et al., 2005; ASEVEDO; KOCH, 2004).

In this way, institutions should seek new models of management and skilled health professionals that have a different look in developed activities, ensuring greater control of costs and quality of care provided.

Among health professionals, the nurse has an important role in controlling costs, since besides providing care to the patient, is also responsible for purchasing, forecasting, organizing and controlling

material resources and their costs (CASTILHO et al., 2005; FRANCISCO; CASTILHO, 2002).

Francisco and Castilho (2002) reported that nurses are increasingly involved with financial issues, performing the management of material, human and financial resources, frequently scarce. These authors also argue that nurses needs to seek knowledge in cost area, and must recognize their role of change to reach positive results and balance between costs and quality.

Furthermore, the nurses have worked in all areas of Health, and among the different specialties, we can cite the Maternal and Child Health that comprises a complex area, with the necessity to evaluate the expenditures with technology and procedures for greater optimization of employed resources (FAUNDES et al., 1987).

In the assistance of women, in the area of Obstetrics, there are pathologies associated with pregnancy, as for example the Diabetes Mellitus (DM) and Hypertension.

The DM is a complex syndrome characterized by endocrine-metabolic changes that affect the homeostasis of the organism, caused by absolute or relative deficiency of insulin, being classified as type 1 (absolute absence of insulin), 2 (result from a progressive deficiency in insulin secretion), gestational (diagnosed during pregnancy) and other specifics (ADA, 2010).

The pathophysiology of Gestational Diabetes Mellitus (GDM) is explained by insulin-counter regulatory hormones, physiological stress caused by pregnancy and predetermining factors (genetic or environmental). The main hormone related to insulin resistance during pregnancy is the placental lactogenic hormone, but other hyperglycemic hormones like cortisol, estrogen, progesterone and prolactin are also involved (MIRANDA; REIS, 2008).

The incidence of GDM is about 7% of pregnancies (1 to 14%), varying according to the studied population and diagnostic criteria (ADA, 2010). In Brazil, it is estimated a prevalence of 2.4% to 7.2%, depending on criterion used its diagnosis (BRODY et al., 2003).

According to Rudge and Calderon (2006), the hyperglycemia is responsible for perinatal consequences such as macrosomia, increased risk for birth trauma and cesarean delivery, delayed lung maturity (and consequent respiratory distress syndrome) and metabolic disorders at birth (hypoglycemy, hypocalcemia and hypomagnesemia).

The perinatal outcome is directly related to maternal metabolic control, with evidence of 52.4% of macrosomia, 14.3% of stillborn, and 8.2% of birth defects in pregnant women with inadequate metabolic control, characterized by average glucose higher than 130 mg dL^{-1} in the third trimester (RUDGE et al., 1995).

The literature evidences the importance of cost analysis studies for the field of Nursing and Health, especially with high risk diseases associated with pregnancy, such as DM, because few studies about this subject have been found in literature.

The present study identified the hospitalization costs for pregnant women with DM, in Obstetrics Unit of a University Hospital from São Paulo State.

Material and methods

This is an observational and quantitative study with descriptive analysis of the data, performed in the Technical Sector of Midwifery Nursing (TSN) and Obstetric Center of the Hospital of the Faculty of Medicine of Botucatu - Unesp (HC/FMB/Unesp).

The HC/FMB/Unesp is classified as a public general hospital, with 415 beds, with secondary and tertiary care, and also used as a field of teaching and research for students and professionals of Nursing, Medicine and other courses. The TSN and Obstetric Center of the HC/FMB/Unesp has 29 beds for hospitalization of low and high risk pregnant women.

It was identified the costs with human resources, supplies, telephone, water, sewer, electricity, overheads, and cleaning of the unit under study, from the system of absorption costing of the Center for Cost of the HC/FMB/Unesp. This system allowed obtaining average costs of these parameters: per day of hospitalization (annual cost of the maternity ward divided by the number of hospitalizations performed in the year); per delivery regardless of whether cesarean or vaginal (annual cost of the obstetric center divided by the number of obstetric procedures performed in the year). Moreover, it was identified the costs with drugs and laboratory tests through the records and information provided by the Computer Technical Service (CTS) of the HC/FMB/Unesp.

The costs per record and system of absorption costing were divided into direct (drugs, laboratory tests, human resources, supplies and telephone) and indirect (water, sewer, electricity, overheads and cleaning), which were grouped and appropriate for each sector.

Data gathering was performed throughout 2006 (January to December 2006).

The inclusion criteria for the study of costs were: patients admitted to TSN and Obstetric Center in 2006, during pregnancy or childbirth, with diagnosis of DM (type 1, type 2 or GDM).

Fifty-two diabetic pregnant women participated in this study. They had been admitted

to the TSN and Obstetric Center and met the inclusion criteria, totaling 195 hospitalizations in the year (8.4% of total admissions of the unit).

The data collected were coded, tabulated and processed using the software Epi-Info Version 3.3.2 (DEAN et al., 2005). Then a descriptive analysis was performed, from tables of distribution of the absolute and relative frequencies, mean and median values.

The study was approved by the Research Ethics Committee (REC) of the FMB – Unesp under protocol number 251/2005.

Results and discussion

Characterization of the studied population

The distribution of the patients with DM admitted to the TSN and Obstetric Center, according to general characteristic is listed in Table 1.

Table 1. Distribution of the patients with DM, according to general characteristics, in the TSN and Obstetric Center – HC/FMB/Unesp, 2006.

General characteristics	n	%
Origin		
Area of the DRS VI	50	96.0
City of Botucatu	18	35.0
Other cities	34	65.0
Race		
White	50	97.0
Parda	2	3.0
Marital status		
Married	33	63.6
Common-law marriage	11	21.2
Single	6	12.2
Separate	2	3.0
Occupation		
Domestic activities	33	62.0
General Services	5	10.0
Student	5	10.0
Laboratory Assistant	1	2.0
Aviculturist	1	2.0
Seamstress	1	2.0
Cook	1	2.0
General Assistant	1	2.0
Peasant	1	2.0
Teacher	1	2.0
Secretary	1	2.0
Auxiliary Nurse	1	2.0
Education		
Incomplete Elementary School	19	36.4
Complete High School	12	24.2
Complete Elementary School	7	12.1
Literate	8	15.1
Incomplete High School	3	6.1
Illiterate	3	6.1
Complete Higher Education	0	0

It is noted that 96.0% of admitted patients came from cities of the Health Department (DRS) VI – Bauru – SP, being 35.0% from Botucatu. Considering that the service is a Reference Center for high risk pregnant, it is evidenced the attending of municipalities within its service area.

In the present study, the white race predominated (97.0%). Other authors also foundsimilar data (OLIVEIRA et al., 2008; ZAMPIERI, 2001).

Regarding the marital status, 63.6% are married, similarly to Zampieri (2001).

The predominant occupation was the domestic activity (62.0%), corroborating data also found by Zampieri (2001).

In relation to education, 36.4% have incomplete elementary school. Similar data was also observed by other authors (OLIVEIRA et al., 2008; ZAMPIERI, 2001).

Along the study period, 2,203 hospital admissions had occurred in the TSN and Obstetric Center of the HC/FMB/Unesp, and 195 (8.4%) corresponded to patients with DM. Among these 195 admissions, 143 have been performed during pregnancy, and 52 for childbirth (Table 2).

Table 2. Distribution of patients with DM, according to the type and amount of hospital admissions, in the TSN and Obstetric Center – HC/FMB/Unesp, 2006.

Characteristics	n	%
Admission of diabetic pregnant during pregnancy	143	6.2
Admission of diabetic pregnant for childbirth	52	2.2
Total of admissions of diabetic patient in the Obstetric Unit	195	8.4
Other admissions in the Obstetric Unit	2108	91.60
Total of admissions in the Obstetric Unit	2303	100.0

Zampieri (2001) observed that 10.5 % of admissions in the Obstetric Unit of Florianópolis were caused by diabetes during pregnancy. According to ADA (2010), the incidence of GDM is around 7% (ranging from 1 to 14%, according to used criterion and studied population) and in Brazil, it is estimated a prevalence of 2.4% and 7.2% (BRODY et al., 2003). Our data are similar to other found in literature, but is important to highlight that the studied population came from a reference center for high risk pregnant.

In Table 3 is presented the distribution of patients according to the age (in years) at the moment of hospital admission and length of stay during pregnancy and for childbirth. We can notice that half of women admitted with diagnosis of DM had 30 years old and remained hospitalized for one day during pregnancy and four days for childbirth (being 5 days for cesarean and four days for vaginal delivery). These data show the importance of differentiate the costs for admission during pregnancy and for childbirth,

since the stay length is different for each one, interfering on the costs.

Table 3. Distribution of patients with DM, according to the age and stay length, in the TSN and Obstetric Center – HC/FMB/Unesp, 2006.

Characteristics	Means	Medians
Patient age (in years)	30.48 ± 4.93	30 (29; 35)
Length of Stay (LS; in days)		
LS during pregnancy	1.84 ± 1.83	1 (1;2)
LS for childbirth	5.17 ± 3.50	4 (3;5)
LS in Cesarean Delivery (CD)	5.69 ± 3.82	5 (4;6)
LS in Vaginal Delivery (VD)	4.26 ± 2.70	4 (3;5)

The Table 4 shows the distribution of patients with DM in the studied unit, according to the type of delivery. It is verified that 63.4% of patients were submitted to cesarean delivery.

The World Health Organization suggests that the rate of cesarean section should be around 15%. According to Information System on Live Births (Sinasc), in 2002, the incidence of cesarean was 38.6%, and exceeds 40% in all states of the South, Southeast and Center-West regions (BRASIL, 2010; QUEIROZ et al., 2005; MELCHIORI et al., 2009).

Table 4. Distribution of patients with DM, according to the type of delivery, in the TSN and Obstetric Center – HC/FMB/Unesp, 2006.

Type of delivery	n	%
Cesarean section in high risk pregnant	33	63.4
Normal delivery in high risk pregnant	19	36.5
Total	52	100.0%

Melchiori et al. (2009) highlighted that the cesarean section was performed in 72% of pregnant women in the particular health system, and in 31% of users of the Brazilian Unified Health System.

This study was carried out in a maternity of a university and teaching hospital that assists high risk pregnant, being the population compounded of patients with DM, which can justify the increased number of cesarean delivery.

The Table 5 presents the distribution of patients with DM in the studied unit, according to the type of discharge and number of live births. It can be observed that 100.0% of patients were discharged during pregnancy and at childbirth. In relation to the hospital admission at childbirth, 100.0% of the children were born alive.

In agreement with several authors, the perinatal mortality of diabetic women during pregnancy can vary between 2.8% and 6.2% (FALCÃO, 2000; YAMAMOTO et al., 2000; BASSO et al., 2007; MONTENEGRO JÚNIOR et al., 2001; CORREA; GOMES, 2004; CARVALHO et al., 2000). Our study stresses the importance of the follow-up of pregnant with DM in a specialized reference center.

Table 5. Distribution of patients with DM, according to the type of discharge and number of live births, in the TSN and Obstetric Center – HC/FMB/Unesp, 2006.

Characteristics	During pregnancy		At childbirth	
Type of Discharge	n	%	n	%
Discharge	143	100.0	52	100.0
Live births	-	-	52	100.0
Total	143	100.0	52	100.0

Cost analysis of hospital admissions for diabetic pregnant women

The Table 6 lists the cost of delivery of patients treated in the Obstetric Center – HC/FMB/Unesp. It is verified that the cost of delivery regardless of the type (cesarean section or vaginal) and diagnosis of the patient was R$ 949.45.

Table 6. Costs of delivery (cesarean or vaginal), values in Brazilian currency (real), of patients treated in the Obstetric Center – HC/FMB/Unesp, 2006.

Costs	For delivery
Direct costs	
Human Resources (Nursing and Medical team)	534.55
Supplies and Drugs	74.20
Laboratory tests	-
Telephone	0.32
Indirect costs	
Overhead	305.33
Water/sewer	4.55
Electricity	7.65
Cleaning	22.85
Cost of delivery	949.45

A systematic review of the literature revealed that the costs of deliveries are from U$ 1,000 to 2,200 for uncomplicated vaginal delivery and from U$ 2,100 to 5,900 for cesarean delivery (BRANDLE; HERMAN, 2003). The cost of delivery in the studied unit was lower than found in literature.

The total cost of a hospital admission for a patient with DM was R$ 362.93 during pregnancy, R$ 2,642.65 for cesarean delivery and R$ 2,319.77 for vaginal delivery (Table 7).

No study was found in national literature on hospitalization costs in Obstetrics area which prevented the comparison with our data.

The Table 8 shows the values paid by health system (SUS) for admissions of patients with DM. the values of hospitalizations of patients with DM were R$ 40.38 during pregnancy, R$ 812.34 for cesarean delivery and R$ 572.48 for vaginal delivery.

Table 7. Costs of hospital admissions for patients with DM, values in Brazilian currency (real), according to the type of hospitalization and delivery, in the TSN and Obstetric Center - HC/FMB/Unesp, 2006.

Costs	Hospitalization during pregnancy	Hospitalization for cesarean delivery	Hospitalization for vaginal delivery
Direct costs			
Human Resources (Nursing and Medical team)	133.08	133.08	133.08
Supplies	14.15	14.15	14.15
Drugs	22.67	7.78	10.13
Laboratory tests	14.86	5.46	7.05
Telephone	0.02	0.02	0.02
Indirect costs			
Overhead	154.00	154.00	154.00
Water/sewer	3.13	3.13	3.13
Electricity	5.27	5.27	5.27
Cleaning	15.75	15.75	15.75
Cost /patient/day	362.93	338.64	342.58
Cost of delivery	-	949.45	949.45
Total Cost / Hospitalization	362.93*	2642.65**	2319.77**

*Total cost/hospitalization during pregnancy = cost/patient/day [considering time of hospitalization in days (values in medians): one day during pregnancy] **Total cost / hospitalization for delivery = cost/patient/day [considering time of hospitalization in days (values in medians): five days for cesarean delivery and four days for vaginal delivery] + cost of delivery .

Table 8. Distribution of hospitalized diabetic patients, according to the value paid by SUS, in the TSN and Obstetric Center - HC/FMB/Unesp, 2006.

Characteristics	During pregnancy	For delivery
Value of admission (Real)*	R$ 40.38 (40.38; 235.33)	R$ 812.34 (585.76; 812.34)
Cesarean delivery	-	R$ 812.34 (812.34; 812.34)
Vaginal delivery	-	R$ 572.48 (572.48; 592.43)

*Values in medians.

On the other hand, the studied location is a maternity ward from a university and teaching hospital with several professionals that perform other activities (extension, teaching and research) besides the assistance, which can contribute to increase the value of direct costs (manpower). Moreover, the participation of students (Medicine, Nursing, Nutrition, Physiotherapy, among others) increase the cost of supplies and test requests, even with protocols established in the institution, contributing to increase the costs of admissions (Figure 1).

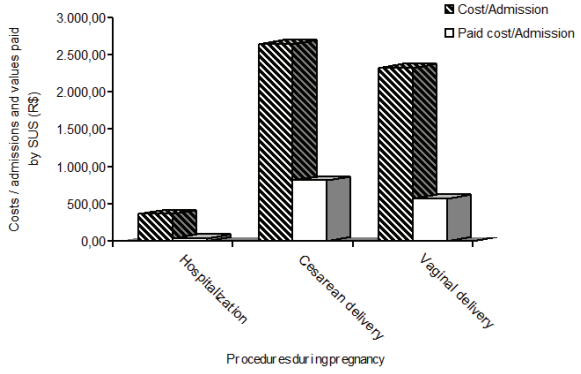

Figure 1. Cost of admissions and values paid by SUS, in Brazilian currency (real), of diabetic patients hospitalized in the TSN and Obstetric Center - HC/FMB/Unesp, 2006.

Conclusion

This study permitted the identification of costs of hospital admissions for patients with DM during pregnancy and at childbirth in the obstetric unit of a university hospital of São Paulo State.

The total cost of a hospital admissions for a patient with DM is R$ 362.93 during pregnancy, R$ 2,642.65 for cesarean delivery, and R$ 2,319.77 for vaginal delivery.

It was also demonstrated that the costs of hospital admissions for patients with DM were higher than the values paid by SUS.

The study evidenced the importance of making analysis of costs as a valuable management tool. Also, it was shown the need for further studies in the area like the analysis of time (in hours) of nursing, doctors, other professionals that provide care, dependence degree of the patients, among other subjects, in order to identify the costs and adopt measures and protocols to optimize the resources.

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