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Case Report

Microeconomics of managing Diabetic Ketoacidosis in a rural Nigerian child of low socioeconomic class: a case report

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ABSTRACT: Health care delivery is a concurrent responsibility of the various levels of government in Nigeria where most of the populace earn less than one dollar a day. The total expenditure on Nigerian health care as a percentage of gross domestic product, and the percentage of federal government expenditure on health care is far below the World Health Organization recommended standard. Thus, caregivers pay out of their pockets to settle health care expenses of their children thereby creating a negative microeconomic impact on parents, households and health workers. Herein, we report the case management of newly diagnosed Diabetic Ketoacidosis (DKA) in an eight-year-old boy from a low socioeconomic class (SEC), and the costs implication of the child's hospital care. After forgoing indirect costs like opportunity cost which is difficult to determine, the direct total cost involved in patient's hospital care for DKA was forty eight thousand eight hundred naira only (N48, 800.00) equivalent to three hundred and ten United States Dollars and eighty three cents (310.83 USD). Based on the high cost of managing DKA observed in the study case, there is a need to convince health system administrators and policy makers to strengthen health insurance so as to enable patients, especially those from low SEC, to pay their hospital bills promptly.

KEY WORDS: ***Diabetic ketoacidosis; Microeconomics; Costs; Low socioeconomic class; Child; Yola; Nigeria***

INTRODUCTION

Microeconomics is a branch of economics that deals with allocation of limited resources by individuals, households and firms based on financial and opportunity costs that are centered on prices of commodities.[1] Typically it applies to markets where goods or services are bought and sold. Philip and Sydney,[2] in 1969 defines marketing as the activities of institutions and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large. Based on this knowledge, the hospital can be seen as a market place where transactions in health care goods, services (needs and wants) are carried out. Microeconomics basically centers on demand and supply relative to price (cost) of a commodity and in this case health care services represent these commodities.[1,2] One of the goals of microeconomics in health is to analyze allocation of limited resources chiefly financial cost (money), amongst many alternative uses (opportunity cost) during treatment of diseases.[3]

Health care provision in Nigeria is a concurrent responsibility of the three tiers of government namely federal, state and local governments.[4] Because Nigeria operates a mixed economy, the Nigerian health sector is broad and comprised of private for-profit, non-governmental (NGOs), community based organizations (CBOs), faith based organizations (FBOs) and traditional health care providers.[4] The federal government regulates affairs of tertiary health care administered by the University Teaching Hospitals, Federal Medical

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Centres like Federal Medical Centre Yola (FMCY) where the index case was managed. State government coordinates activities of secondary health care by general hospitals, while local government focuses on primary health care (PHC) and dispensaries. The federal and state governments through national and state primary health care development agencies (NPHCDA and SPHCDA) also monitor the activities of PHC.

Availability of health care to a child is subject in most cases to caregivers' decision relative to house hold income. A significant number of households earn less than one dollar in a day and almost all health care expenditures are out of pocket.[5,6] Because Nigeria's health care budget has always been lower than the World Bank standard for low income countries, parents/caregivers are saddled with the responsibilities of health care cost of their children and other family members.[7] This has led to a catastrophic health care financing by parents that could lead to wider income redistribution in our society, which has high income/financial inequality. This case report examined mainly the cost implication of managing DKA in a child from a low SEC admitted in FMCY, a public hospital.

CASE DETAILS

An eight year old Fulani boy from Mayo-Belwa community of Adamawa state, Nigeria, presented to FMCY with Fever, headache, vomiting, epigastric pain and loss of consciousness. His parents are peasant farmers who belong to a low SEC based on Oyedeji's SEC scoring model.[8] Physical examination revealed an ill-looking boy, febrile (temperature of 38◦C), pale and dehydrated. He was dyspnoeic (Kussmaul respiration) and tachypnoeic, respiratory rate of 50 Cycles/minute, breath sound was vesicular and no crepitations. His pulse rate was 150 beats/minute; (tachycardia), low volume, blood pressure was 70/40 mmHg, first and second heart sounds were heard with no murmurs. Abdomen was scaphoid and patient was also unconscious with a Glasgow coma scale of 10/15. Bedside urinalysis showed the presence of protein, glucose and ketones. Cerebrospinal fluid analysis excluded pyogenic meningitis. Azotemia with urea of 24.8mmol/L was observed, but electrolytes were within normal limits. Random blood sugar showed hyperglycemia of 25.5mmol/L, full blood count showed packed cell volume of 33% and neutrophilia of 80%.

Diagnosis of DKA was made and the patient was placed on insulin, intravenous fluids and antibiotic. There was remission of DKA by the fifth day of admission. Patient and caregiver were educated on good dietary habits by the dietitian. The patient improved and was discharged after spending 30 days on admission. Total financial cost incurred in the course of managing the patient amounted to forty eight thousand eight hundred naira only (N48, 800.00) equivalent to three hundred and ten United States Dollar eighty three cents (310.83 USD). Hospital bed space per day was 50 naira, which was equivalent to 32 cents; overall hospital stay costed 1500 naira (9.55 USD). Transportation/week was 700 naira (4.46 USD) totaling 2800 naira (17.83 USD) for four weeks. Further breakdown of the total financial cost are shown in **Table 1** and **2** below.

Table 1:Cost of investigations and sources of payment

Investigation	Frequency	Cost/unit frequency (Naira & USD)	Total cost (Naira & USD)	Payment sources
EUCr	3	600 (3.82)	1800 (11.47)	Father/Relatives
FBC	1	400 (2.55)	400 (2.55)	Father
PCV	3	100 (0.64)	300 (1.92)	PF
Urinalysis	5	200 (1.27)	1000 (6.37)	Father/Relatives
CSF analysis	1	550 (3.50)	550 (3.50)	Father
RBS	68	200 (1.27)	13600 (86.62)	Father/PF
Total			17650 (112.42)	

EUCr = Electrolyte urea and creatinine; FBC = Full blood count; PCV = Packed cell volume; CSF = Cerebrospinal fluid; RBS = Random blood sugar; PF = Paediatric funds; USD = United States Dollars

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Table 2: Quantity and cost of treatment commodities and source of payment

Treatment Commodities	Quantity	Cost/unit quantity (Naira & USD)	Total cost (Naira & USD)	Payment sources
Insulin	5	2500 (15.92)	12500 (79.62)	Father/PF
Glucometer	1	10000 (63.69)	10000 (63.69)	PF
IVFs	15	250 (1.59)	3750 (23.89)	Father
Cannulas	3	100 (0.64)	300 (1.91)	Father
Antibiotic	1	300 (1.91)	300 (1.91)	Father
Total			26850 (171.02)	

IVF = Intravenous fluids; PF = Paediatric funds; USD = United States Dollars

DISCUSSIONS

Financial cost and payment of health care bills by a caregiver or households alone could have impoverishing effects on the households. Wagstaff and Van Doorslaer in 2001,[9] argued that medical expenses could push households and caregivers into poverty, especially those found in low SEC, such as the index case report. Not only will the hospital bills lead to poverty, it will also worsen the effects of poverty on caregiver and households. Worsening effects of poverty could have been the reason some investigations and treatment cost of the index case were settled by relatives and money generated from pediatric purse called pediatric fund. The pediatric fund is money pooled together by willing medical and health workers as well as donor groups and philanthropists that is used for offsetting medical expenses of an indigent child. Indigent children are usually found within the low SEC and are living below the poverty line. Moreover, the world health organization has documented that 70% of Nigerians live below the poverty line. Nigeria's health care budget has been consistently low despite the gross national income per capita being 930 USD.[5,7] With this in mind, the observation made in the present case report would be anticipated.

The net cost of managing DKA in our patient can be viewed as attributable cost of treatment (treatment cost) minus the cost of preventing occurrence of disease (prevention cost). Cost analysis in index patient should consider all resources especially money that was used for treatment intervention since other labor expenses like that of experts (doctors, nurses, dietician etc.) are paid for by the federal government of Nigeria.[10] This net cost may further increase because not only was direct financial costs of treatment involved, opportunity costs also formed part of the care. Costs involved in making the diagnosis of DKA in the patient are primarily of concern when these costs cannot be passed on to the patient or an insurer. The same is true of costs for purchase and administration of drugs and other therapeutic agents.

Caregivers and households experience both direct and indirect costs of health care. Indirect costs for example would be care giver loss of productivity as a result of caring for a sick child, and this could result in reduction of income.[3] Loss of productivity affected the father of the patient because he had to abandon the market for at least three days in a week to come to the hospital to provide money for the continuous care of his child. Because opportunity costs and indirect costs involved in patient care are difficult to measure, authors usually focus on hospital charges and length of stay to determined microeconomics of patient management.[3] These later variables are objective and relatively easy to collect, thus, these parameters were applied in current case report. The financial impact of managing DKA may have another facet. The relative benefit of being able to use another drug as an alternative when drug of choice is expensive or not available.[3] Because there are no suitable alternatives, insulin still remains the best drug used in the treatment of DKA; index case did not benefit from lower cost alternatives.

The current case stayed for 30 days on admission in the hospital despite DKA resolution within the first week of admission because of the difficulty we had in controlling his blood glucose levels. Different brands of insulin from various manufacturers with some expired and some nearing expiry date were observed during the course of managing the child. In this regard, the effectiveness of some of the insulin could be doubtful. These could be the

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reason for the difficulty encountered in managing the patient's blood glucose levels.

In conclusion, assessing the microeconomic impact of managing DKA in a child is a challenge because many variables may be involved. As the Nigerian health-care system is reforming, health care managers concerned with cost and benefit of health care services have become important decision makers. Therefore, there is a need to convince health system administrators that managing DKA, a non-communicable disease, especially in patients from low SEC, is a serious issue. Action, for instance, in strengthening health insurance is needed to give this important health issue the priority it deserves particularly among patients from low SEC. Attention of government and professional groups should be drawn in order to mitigate the effects of medical bills of low SEC patients who cannot offset their hospital bills.

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