

ORIGINAL ARTICLE**ECONOMIC BURDEN OF DIABETIC CARE IN GOVERNMENT HEALTH FACILITIES IN SELANGOR**

Sharifa Ezat WP*, Azimatun NA*, Amrizal MN**, Rohaizan J***, Saperi BS **.

*Community Health Department UKMMC.

**Case Mix Center UKMM.

***Ministry of Health Malaysia.

ABSTRACT

Background : The worldwide prevalence of diabetes is increasing, as is the demand for and cost of medical care. Diabetic Mellitus (DM) prevalence in Malaysia rose from 6.3% of the population in 1986 to 8.3% in 1996 and costs need to be managed more effectively.

Objective : To estimate the financial burden of diabetic care, including providers' and patients' costs in government facilities in Selangor and to determine factors influencing cost of diabetic care.

Methodology : A cross-sectional study was conducted from September to November 2005 among Hospitals with and without Specialist and Health Clinics. Total sample of 361 subjects with type 2 diabetes representing both inpatient and outpatient were chosen randomly. Results were analyzed using SPSS version 13.0.

Results : The average cost for a diabetic patients' admission in a Hospital with Specialist was RM1951 and RM1974 for patient admitted in a Hospital without Specialist and these cost difference was not statistically significant ($p>0.05$). Providers' mean cost for outpatient care was RM772.69 and RM761.07 respectively for Hospital with Specialist and Hospital without Specialist per year. As for the health clinics the average providers' cost for a patient was RM385.92 per year. The cost difference was statistically significant ($p<0.05$). Patient's mean cost was RM68.77 in Hospital with Specialist, RM71.73 in Hospital without Specialist and RM72.11 in Health Clinics and the cost difference from the patient's perspective was statistically not significant ($p>0.05$). The mean total costs of outpatient care were RM841.46, RM832.80 and RM458.01 per year for Hospital with Specialist, Hospital without Specialist and Health Clinics respectively. Level of care and length of stay were the influencing factors for inpatient provider's cost. The overall provider's cost for outpatient diabetic care was influenced by level of care, number of visits and complications. Cost of treating diabetes mellitus year 2004, was estimated at RM18,956,021.51 which was equivalent to 3.3% of total state health expenditure.

Conclusion : As much as 60.2 % was spent on management of outpatient diabetic care and 39.8% for management of inpatient diabetic care. Financial burden of diabetic care is predominantly for outpatient care. Therefore, effective and efficient management of outpatient care is needed to improve allocate efficiency, equity, accessibility and appropriateness of the health care system so that the health care services delivered to the nation are of good quality.

Keywords: Diabetes Mellitus, Providers' Cost, Patients' Cost, Outpatient, Inpatients Care.

Received Oct. 2009; Accepted Dec. 2009

Correspondence to: Dr. Azimatun Noor Aizuddin

Department of Community Health,

UKM Medical Centre,

Jalan Yaacob Latiff, Bandar Tun Razak,

56000 Cheras, Kuala Lumpur. MALAYSIA

Tel : +603 9145 6422, Fax : +603 9173 7825

(e-mail: azimatunnoor@gmail.com)

INTRODUCTION

Diabetes mellitus is an issue of growing public health concern in both the developed and developing countries and the commonest metabolic abnormality in the world¹. Type 2 diabetes (Non-insulin dependent diabetes, NIDDM) is the commonest form of diabetes constituting nearly 90% of the diabetic population in any country². A diabetes epidemic is underway. An estimated 30 million people world-wide had diabetes in 1985³. The latest WHO estimate for the number of people with diabetes world-wide in 2000 is 177 million. This will increase to at least 370 million by 2030. The majority of this increase will occur in developing countries, which may experience a 170% increase in the number of adults with diabetes from 1995 to 2025.

Prevalence of diabetes in adults ranges from less than 2% in Tanzania and Mainland China to 40-50% in urban Papua New Guinea²⁻³. In the developing nations the incidence is escalating and exceptionally high prevalence is seen in population who is adopting a lifestyle different from its traditional past. In Malaysia, a 1996 National Health Morbidity Survey indicated that prevalence of diabetes was 8.3% compared to 6.3% in a similar survey done in 1986⁴. As the number of people with diabetes grows worldwide, the disease takes an ever-increasing proportion of national health care budgets¹. Because of its chronic nature, the severity of its complications and the means required to control them, diabetes is a costly disease, not only for the affected individual and his or her family, but also for health authorities^{1,5,6}.

There is no specific break-down of the expenditure on diabetic care in Malaysia. The Disease Control Division of Ministry of Health initiated a study in 2002 to determine the direct costs of treating diabetics in an outpatient setting. The direct cost per diabetic patient per year was RM 241.19⁷. The increasing trend of the prevalence and the expenditure of diabetes mellitus in Malaysia indicate the need to estimate the financial burden of diabetic care in the government health facilities in Malaysia.

This study aims to study and estimate the financial burden of diabetic care in the government health facilities in Selangor and to identify factors influencing the cost in hospitals and health clinics. In particular, it's a cost analysis study of diabetic care in Hospital with Specialist, Hospital without Specialist and Health Clinics, comparing provider's cost,

patient's cost and total cost of diabetic care among them. Factors influencing the costs of diabetic care were also identified for example patient's factors (sociodemography, comorbidity) and service factors.

METHODOLOGY

A cost analysis study for diabetes mellitus was carried out at three different levels of the government health facilities in the State of Selangor, Malaysia namely Hospitals with Specialist, Hospitals without Specialist and Health Clinics from July 2005 till November 2005. A total of 361 cases were recruited in the study; 226 and 135 respondents for outpatient and inpatient respectively. Cost analysis was conducted from the perspective of both the provider and patients'. Samples were chosen from a Hospital with Specialist, two Hospitals without Specialist and five Health Clinics.

Instruments

Data was collected using an economic evaluation form which collect information on hospitals and health clinics' expenditure for the year 2004 and was used for macro costing. This information's were used to estimate average unit cost for capital cost and recurrent cost. The costs categories were buildings, equipments, staffs salaries, pharmacy (drugs and non-drugs), laboratory, radiology, administration, food and kitchen services, and operation and maintenance. Cost category of operation and maintenance included utility cost, cleaning services, general engineering, maintenance of biomedical instruments, laundry, linen services and clinical waste management. Guided questionnaires were used to collect information from inpatients' and outpatients' cost for every visit to the hospitals or health clinics. The costs categories included were transport, fees and waiting time.

Costing

The principle of top-down costing was used in the cost analysis. Many components of the provider's cost were shared with other services provided by the hospitals or clinics. Therefore allocation or apportionment method was used based on ratio of diabetic patients' days for inpatients and for outpatient cases, ratio of diabetic patients visit to the clinic per year (Figure 1 and 2).

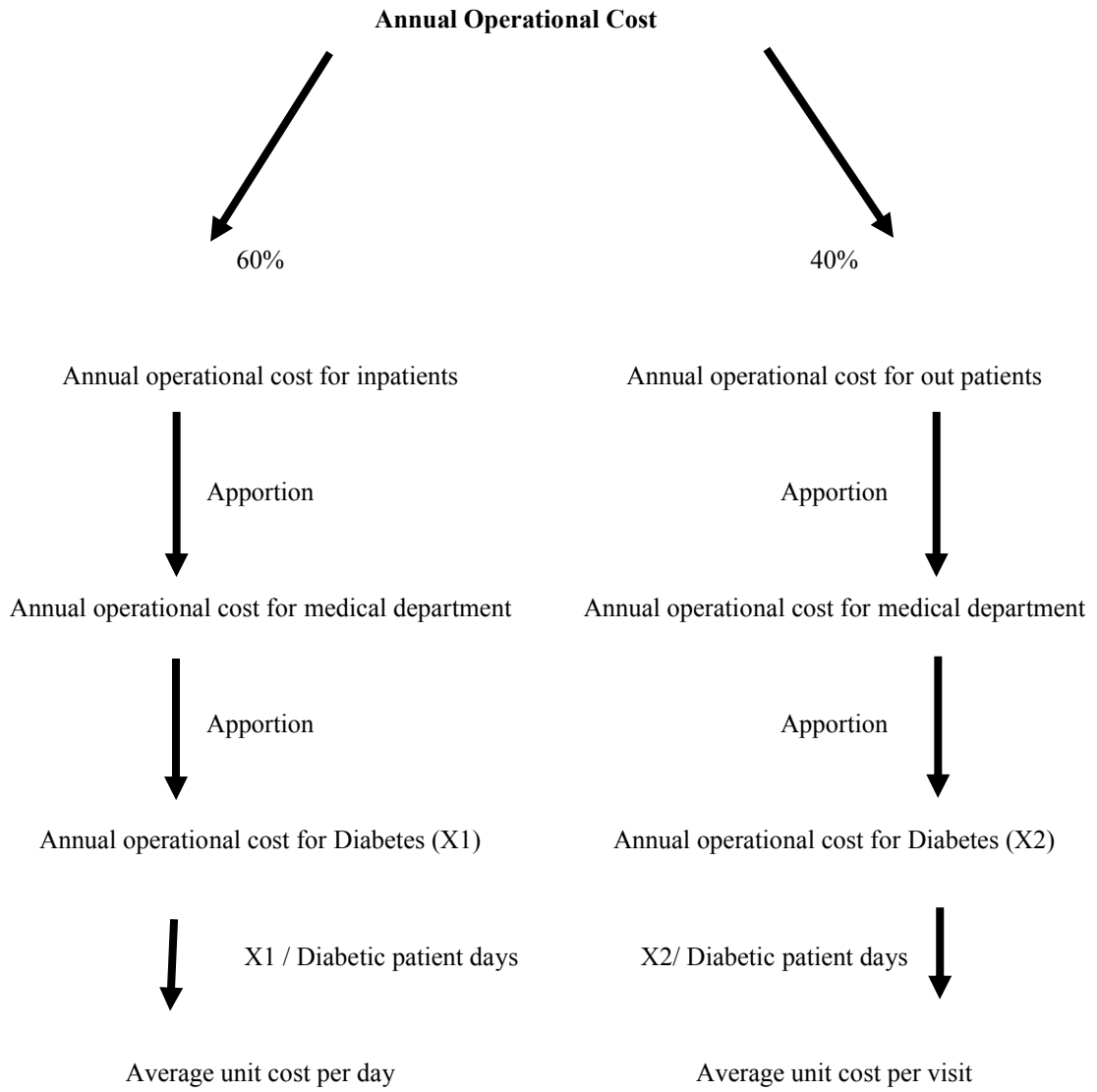


Figure 1 Macro costing method in hospital

Annual Operational cost for Health Clinics

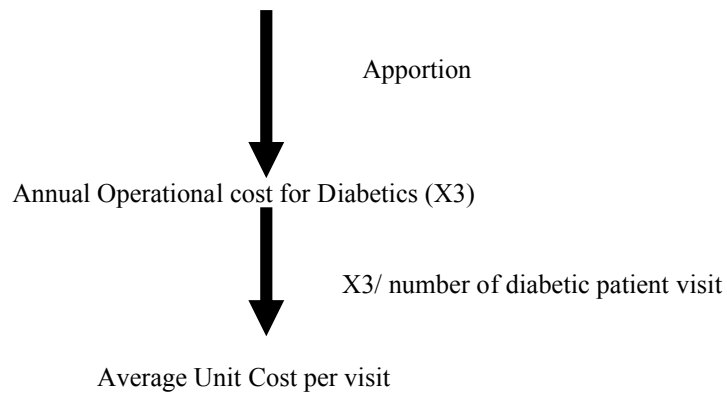


Figure 2 Macro costing method in health clinics

Data analysis

Cost analysis was performed for all level of care on both the provider’s and patient’s perspective, then comparison of costs was made. Statistical analysis was conducted using Statistical Package for Social Science (SPSS) version 13.0 to determine the significant difference of cost incurred by level of care and factors influencing the cost.

RESULTS

A total of 361 patients who fulfilled the inclusion criteria were included in the study. The sociodemographic characteristics studied were gender, age, ethnic group, income, working status and education level.

Table 1 illustrates the summary of average unit cost per day for each component of provider’s cost for inpatients. Building, operational and maintenance, pharmaceutical and staff salary cost contributed the highest percentage from the overall provider’s cost for tertiary, secondary and primary hospital.

Table 1 Average unit cost per day for cost category (inpatients)

Cost Category	Tertiary Hospital RM (%)	Secondary Hospitals RM (%)	Primary Hospital RM (%)
Building	158.75 (41.13)	85.51 (21.93)	80.76 (18.27)
Equipment	13.69 (3.55)	5.43 (1.39)	9.91 (2.24)
Operation & Maintenance	60.85 (15.77)	74.29 (19.05)	95.11 (21.52)
Laboratory	6.23 (1.61)	4.11 (1.05)	8.55 (1.93)
Food & Kitchen Services	6.09 (1.58)	7.99 (2.05)	6.28 (1.42)
Pharmacy	49.35 (12.79)	59.94 (15.37)	66.11 (14.96)
Radiology	1.92 (0.50)	1.06 (0.27)	1.43 (0.32)
Administration	23.97 (6.21)	14.06 (3.61)	20.33 (4.60)
Staff Salary	65.09 (16.87)	137.56 (35.28)	153.57 (34.74)
Total Provider’s Cost	385.94 (100.00)	389.95 (100.00)	442.05 (100.00)

Table 2 Average provider's cost per admission by level of care

<i>Cost Category</i>	Mean Cost per Admission (RM)		p value
	Hospital with Specialist	Hospital without Specialist	
Building	802.99	393.21	0.000*
Equipment	69.24	36.72	0.000*
Operation & Maintenance	307.79	402.93	0.124
Laboratory	31.51	30.37	0.087
Food & Kitchen Services	30.80	33.63	0.141
Pharmacy	249.59	298.98	0.197
Radiology	9.71	5.93	0.000*
Administration	121.23	81.98	0.002*
Staff Salary	329.21	690.69	0.000*
Total Provider's Cost	1951.00	1974.44	0.480

The table 2 illustrates the average cost for each component of the provider's cost per admission. The cost of treating diabetes mellitus per admission for Hospital with Specialist was RM1951.00 while for Hospital without Specialist was RM1974.44. Test of independents samples results also indicate that there was a significant difference between the two level of care for cost of building, equipments, radiology, administration and staff salary with $p < 0.05$. However there was no significant difference for the overall provider's

cost for inpatients between the two level of care at $p = 0.480$.

The average unit cost per visit for outpatient samples in hospitals is shown in Table 3. Cost component of building, operational and maintenance cost, pharmaceutical and staff salary were costs identified that contributed the highest percentage to the overall cost for tertiary, secondary and primary hospitals.

Table 3 Average outpatients cost per visit by hospital level and cost category

<i>Cost Category</i>	Tertiary Hospital RM (%)	Secondary Hospitals RM (%)	Primary Hospital RM (%)
Building	85.73 (44.08)	32.75 (22.90)	38.22 (19.74)
Equipment	7.69 (3.95)	2.08 (1.45)	4.69 (2.42)
Operation & Maintenance	22.43 (11.53)	28.45 (19.89)	45.01 (23.25)
Laboratory	3.50 (1.80)	1.58 (1.10)	4.04 (2.09)
Pharmacy	25.79 (13.26)	22.94 (16.04)	31.28 (16.16)
Radiology	1.08 (0.56)	0.41 (0.29)	0.68 (0.35)
Administration	13.47 (6.93)	5.70 (3.99)	9.62 (4.97)
Staff Salary	34.78 (17.88)	49.11 (34.34)	60.04 (31.02)
Total Provider's Cost	194.47 (100.00)	143.02 (100.00)	215.40 (100.00)

Provider's cost per diabetic patient per year was RM772.69 for Hospital with specialist, RM761.07 for Hospital without Specialist and RM385.92 for the Health Clinics. In the ANOVA test, there are a significant difference for the provider's cost per diabetic patient per year between hospitals and health clinics (table

4). However, for health clinics' level of care, the highest percentage that contributed to the overall provider's cost were cost of building, staff salary and pharmacy. Operational and maintenance cost did not seem to contribute much to the overall provider's cost for the health clinics. (Table 4).

Table 4 Average Provider's Outpatients Cost per Year by Level of Care

Cost Category	Mean OPD Cost (RM)			P value
	Hospital with Specialist	Hospital without Specialist	Health Clinics	
Building	340.63	174.28	211.73	0.000*
Equipment	30.55	11.07	4.28	0.000*
Operation and Maintenance	89.12	101.39	12.74	0.000*
Laboratory	13.91	8.4	3.94	0.000*
Pharmacy	102.47	122.07	60.34	0.000*
Radiology	4.29	2.18	4.12	0.000*
Staff Salary	138.19	261.34	96.37	0.000*
Administration	53.52	30.33	40.23	0.000*
Total Provider's Cost	772.69	761.07	385.92	0.000*

Table 5 illustrates the average patient's cost per diabetic patient per year for the 3 different type of healthcare provider. The average cost per diabetic patient per year from the patient's perspective was RM68.77 for Hospital with Specialist, RM71.73 for Hospital without

Specialist and RM72.11 for the Health Clinics. Through ANOVA, the difference in cost finding was not statistically significant at $p=0.305$.

Table 5 Average Patient's Cost per Year by Level of Care

Cost Category	Mean Cost (RM)			P value
	Hospital With Specialist	Hospital Without Specialist	Health Clinics	
Waiting Time	18.53	28.08	36.93	0.252
Transport	35.93	29.19	29.16	0.904
Clinic Fees	14.31	14.46	6.016	0.000*
Total Patient's Cost	68.77	71.73	72.11	0.305

The overall cost incurred in treating diabetics from both the provider and patient perspective is shown in table 6. The overall cost incurred for Hospital with Specialist, Hospital without Specialist and Health Clinics

was RM841.46, RM832.80 and RM458.01 respectively. There was significant difference between healthcare providers in view of the overall cost incurred ($p<0.0001$).

Table 6 Average Outpatient Cost per Diabetic per Year by Level of Care

Cost Category	Hospital with Specialist Mean (RM)	Hospital without Specialist Mean (RM)	Health Clinics Mean(RM)	P value
Provider	772.69	761.07	385.92	0.000
Patient	68.77	71.73	72.11	0.305
Overall Cost	841.46	832.80	458.01	0.000

The results of multivariate analysis of this study showed that length of stay and level of hospitals were the influencing factors for the inpatients as shown in table 7. As for the overall cost for outpatient, the frequencies of

visits as well as type of healthcare provider were found to be the influencing factors (Table 8).

Table 7 Factors Influencing Provider's Cost for Inpatients

Factors	Unstandardised coefficients		Standardised coefficients		
	B	Std error	Beta	t	Sig.
Constant	168.953	120.333		1.404	0.16
Hospital	-121.9	15.992	-0.06	-7.623	0.00
Age	0.093	1.147	0.001	0.081	0.935
Length of stay	408.348	3.235	0.98	126.219	0.00
Complication/Co-morbidity	57.89	54.76	0.008	1.057	0.292
Gender	17.588	24.79	0.006	0.709	0.479
Race	-11.630	12.856	-0.007	-0.905	0.367

Table 8 Factors Influencing Overall Costs for Outpatients

Factors	Unstandardised coefficients		Standardised coefficients		
	B	Std. error	Beta	t	Sig.
Constant	-337.43	173.20		-1.95	0.053
Gender	20.12	29.49	0.03	-0.68	0.496
Age	-0.41	1.54	-0.01	-0.27	0.79
Race	11.99	16.04	0.03	0.75	0.46
Complication	-56.94	32.01	0.08	-1.78	0.077
Duration	-0.73	1.92	-0.02	-0.38	0.702
Frequency of visit	101.41	7.03	0.61	14.43	0.000
Type of healthcare provider	296.57	20.33	0.64	14.59	0.000
Education level	15.19	19.91	0.04	0.76	0.446
Working status	-19.96	22.73	-0.04	-0.88	0.381
Income	0.03	0.02	0.08	1.63	0.10
Co-morbidity	39.59	30.62	0.06	1.29	0.19

DISCUSSION

Rising health care costs is inevitable. Demographic changes and changes in disease pattern and lifestyle would influence health care costs. The introduction of new technologies and ever-increasing consumer expectation for high cost quality care, are factors contributing to rising health care costs. The Ministry of Health operating expenditure in 1990 was RM1.27 billion, increasing to RM4.21 billion or a jump of 331% in 2000. For the year 2003 the Ministry of Health operating budget has been increased to RM5.76 billion representing a jump of 353% as compared to RM1.63 billion in 1990⁸.

The purpose of this study was to perform cost analysis for the treatment of diabetes mellitus and to identify factors influencing the costs. The cost for the treatment of diabetes mellitus was measured from both provider and patient perspectives.

However for inpatient care the analysis was only from the provider's perspective. The nine component costs for inpatient care were building, equipment, operational and maintenance, laboratory, food, pharmacy Radiology, administration and staff salary.

The average cost for treating a diabetic was RM1951 per admission for Hospital with Specialist and RM1974 for Hospital without Specialist. This finding is not much different with the study conducted by Amrizal in 2000, where he found that the cost for treating diabetes mellitus was RM2175 per admission⁸. The highest component cost for the treatment of diabetic inpatient in Hospital with Specialist was cost of building. However for Hospital without Specialist, staff salary contributed the highest percentage to the overall cost incurred in the treatment of diabetes mellitus. This finding is consistent⁹ with the study elucidating staff salary contributed the highest percentage to the overall cost.

The overall cost for inpatients was higher for primary level hospital, compared to secondary and tertiary level hospitals. The difference in the bed occupancy rate (BOR) may explain the discrepancy. The BOR for tertiary, secondary and primary hospitals were 83.9%, 55.5% and 37.4% respectively.

Multivariate analysis showed that length of stay and types of hospital were the factors influencing the cost of treating diabetic inpatients⁸. Although complication and co-morbidity factors were not found to be the factors influencing the cost, however, a diabetic patient with complications tend to require more medication and a longer hospital stay than those without complications. As a result the overall cost may go higher.

The same pattern was observed in the cost of treating outpatient diabetics in the Hospital with Specialist from the provider's perspective. Building, staff salary and, operation and maintenance costs were among the components which contributed the highest percentage to the overall cost¹⁰. Similarly, staff salary was the highest component cost contributed to the overall cost in the Hospital without Specialist and this finding is consistent with the study performed by the Ministry of Health in 2002⁷. However, the three biggest costs categories from the provider's perspective in the Health Clinics were building, staffs salaries and pharmacy⁷. It is a well known fact that the cost of health care is heavily weighted towards personnel given the labour-intensive nature of the service. In Malaysia, drugs and equipment are often imported items. The foreign exchange is scarce and therefore it may represent a higher percentage of total cost.

The analysis of the patient's cost indicates that transport costs per visit and per year was high for both hospitals and health clinics followed by waiting time costs. Geographical factor of the location of the hospitals and clinics; public transport facilities and sufficient number of doctors on duty attributed to the patient's cost and eventually the overall cost.

The overall cost for treating outpatient diabetics was higher in the hospitals as compared to the health clinics. The provider's cost for treating outpatient diabetics was higher in hospitals compared to health clinics; however, from the patient's perspective there was no significant difference between the two levels of care. Therefore, effective and comprehensive management for primary care needs to be strengthened to avoid high expenditure on the inpatient care.

It was estimated that the average provider's cost of treating inpatients diabetics in Selangor was RM 7,7551,391.71 for the year of 2004. As for outpatient diabetics it was estimated that RM 989,506.70 was spent for hospital's outpatient and RM 10,415,123.10 spent for Health Clinics. Therefore, the total expenditure on diabetic care year 2004 was RM 18,956,021.51 which was equivalent to 3.4% from the total expenditure on health for the state. Management of outpatient diabetics was found to incur higher cost (60.2%) compared to inpatient care (39.8%).

CONCLUSION

The measurement and analysis of costs from this study indicates that 60.2% of the total expenditure on diabetic care was spent for outpatient care and 39.8% was spent for inpatient care. In conclusion the financial burden of diabetic care in the government health facilities in the state of Selangor was mainly for outpatient care and the total expenditure on diabetic care for the year 2004 was 3.4% from the total expenditure on health for the state. Hospital and health clinics levels' diabetic management must be increased in efficiency, in order to reduce cost and finally preventive medicine is equally important for the same reason.

REFERENCES

1. American Diabetes Association: Economic consequence of diabetes mellitus in the U.S. in 1997. *Diabetes care* 21, 296-309 (1998).
2. A Bagust, PK Hopkinson, L Maslove, KE Downs & DJ Harrison: Excess health care costs attributable to type 2 diabetes in the United States. *Journal of American Diabetes Association* 50 (2), (2001).
3. Barcelo A Aedo C, Rajpathak S & Robles S. The cost of diabetes in Latin America and the Carribean. *Bulletin of the World Health Organization*, 81(1), 2003
4. Bakri and Rugayah. In: *The Second National Health and Morbidity Survey Report*. Kuala Lumpur: Institute of Public Health, Ministry of Health Malaysia, 1996
5. Alexandria VA. Direct and indirect costs of diabetes in the United States in 1992. *American Diabetes Association*, 1993
6. Barnum H & Kutzin J In. *Public Hospital in Developing Countries: Resource Use, Cost, Financing*. John

- Hopkins University Press for the World Bank, 1993.
7. Ministry of Health. Direct costs of diabetes, 2002
 8. Annual Report 2000. Ministry of Health Malaysia, 2000
 9. Amrizal MN. In: Kajian kos rawatan pesakit bagi ketiga-tiga penyakit *Diabetes Mellitus*, pre eklampsia dan neonatal jaundis di Hospital Universiti Sains Malaysia, Kubang Kerian. Thesis Masters in Public Health, USM, 2000 (unpublished)
 10. Mazlan Bin Haji Abdullah. In: Kajian keberkesanan kos pengurusan Skizofrenia di tiga peringkat jagaan psikiatri di Malaysia. Tesis Ijazah Sarjana Kesihatan Masyarakat, UKM, 2001 (unpublished)