

**ANALYSIS OF THE ECONOMIC COST-OF-ILLNESS IN
MANAGEMENT OF ODONTALGIA AT A TERTIARY HEALTHCARE
FACILITY IN KANO STATE NIGERIA**

Basil .T.O¹, Balarabe S.A², Sheka G.I ³, Muhammad I.A.⁴

¹Public Health Department, Intercountry Centre for Oral Health (ICOH)for Africa Jos, Plateau state, Nigeria.

²Child Dental Department, Aminu Kano Teaching Hospital, Kano state Nigeria

^{3,4} Economics Department, BayeroUniversity Kano, Kano state, Nigeria

1. Dr. Basil TochukwuOjukwu
E-mail; macbasil@yahoo.com
2. Dr. Balarabe Sani Auwalu
E-mail; docsb20@yahoo.co.uk
3. Dr. ShekaGarba Ibrahim
4. Dr. Muhammed I.A.

Corresponding Author

Dr. Basil Tochukwu Ojukwu

Public Health Department, Intercountry Centre for Oral Health (ICOH)for Africa Jos,
Plateau state, Nigeria.

+2348037950258

E-mail; macbasil@yahoo.com

macbasil@yahoo.com

ABSTRACT

Background: Odontalgia is one of the most traumatic experiences and main reason for dental treatment seeking behavior globally hence constitutes public health concern. The resultant undesirable situationsnegatively impact the quality of life of individual and community at large. Individuals experiencing toothache use a combination of self-care; non-prescription medicines, home remedies, and formal care strategies which impact on the economy of the individuals, families and the society. The financial burden differs disproportionately between the insured and uninsured individuals, families, communities, insurance companies, and government both in developed and developing economic countries.

Objective: This paper sought to analyse the direct and indirect cost-of-illness in management of patients presenting with toothache at a tertiary healthcare facility in Kano State.

Materials and Methods: A retrospective cross-sectional study of patients aged 21-60 years treated for toothache in September 2016 at the Dental Clinic of Aminu Kano Teaching Hospital, Kano was conducted.

Results: A total of 191 patients accessed treatment; 71(37.1%) males and 120 (62.9%) females (M/F 1:1.71), mean age; 38.53 years, 66(34.6%) insured, 125(65.4%) uninsured. The total direct medical cost was ₦1,315,145:00k; ₦205,895:00k (₦3,119.62k/patient) insured and ₦1,109,250:00k (₦8,874.00k/patient) uninsured. The direct non-medical and indirect cost were ₦57,050:00k and ₦124,200:00k respectively. The estimated economic cost-of illness was ₦1,496,395:00k with an average cost of ₦7,834.53k.

Conclusion: Toothache was more prevalent in the third and fourth decades of life with the uninsured bearing huge financial risk with consequent tooth fatality. Comparatively, the insured patient accessed more of preventive and restorative care than tooth extraction. Hence, the National Health Insurance Scheme can be modified to protect the larger population from huge financial treatment burden.

Keywords: Odontalgia, cost-of-illness, direct cost, indirect cost

INTRODUCTION

Odontalgia (toothache) is one of the most traumatic experiences and the main reason why people seek dental care treatment Worldwide, thus representing a substantial impact on public health.¹ It causes undesirable situations, such as difficulty sleeping, psychologically distressing, rejection of certain foods, impair work productivity, missed days at school hence negatively impact the quality of life of individual and community at large.²⁻⁹

Pain management is costly, increasing continually around the world as a result of a number of socio-economic factors. Individuals experiencing toothache use a combination of self-care ;non-prescription medicines, home remedies, and formal care strategies which impact on the economy of the individuals, families and the society at large. These financial burdens differ disproportionately between the insured and uninsured individuals, families, communities, insurance companies, and government in developed and developing economic countries.¹⁰⁻¹⁶

The economic cost-of-illness in management of toothache consists of the summation of direct medical costs, direct non-medical cost, indirect (productivity losses) cost for an individual patient.¹⁷⁻²⁰ The study was conceived due to paucity of data on the financial burden dental patients' bear in Nigeria when seeking treatment for toothache. The study aims to analyze the direct and indirect cost-of-illness in management of patients presenting with toothache at a tertiary healthcare facility in Kano State.

MATERIALS AND METHODS This was descriptive cross-sectional study was conducted on 191-patients aged 21 to 60 years managed for odontalgia at the Dental and Maxillofacial Surgery Department of Aminu Kano Teaching Hospital, Kano State, Nigeria from January to December 2016.

Information regarding patient's socio-demographic details, insurance status, clinical history, management details and clinical visits record were retrieved from patient's records. The

departmental treatment price records and the hospital pharmaceutical drugs detail prices were used to estimate cost.

The economic cost-of-illness; direct medical cost of treatment, direct non-medical cost and indirect (productivity losses) cost were calculated for each patient. However, the intangible cost such as psychological pain and discomfort which cannot be evaluated in monetary terms was not used for this study.

Parameters of interest were analyzed and level of significance was set as $P < 0.05$. Descriptive statistics were used in representing categorical variables as frequencies and percentages, whereas mean and standard deviation (SD) were calculated for numerical variables. Data collected was analysis using Statistical Package for Social Scientist (SPSS) version 20.0. Ethical approval was obtained.

RESULTS

There were 191 patients treated over this period; male to female ratio was 1:1.71, age category 31-40 years was dominant (36.6%), traders(30.4%) followed by civil servants(29.8%) were dominant occupation while 65.4% of patients were uninsured.

Prominent pre-treatment services were radiographs(100.0%), scaling and polishing(80.1%) while RCT was accessed more insured patients (20.9%) and extraction by uninsured patients (26.7%).The financial burden ratio of insured and uninsured was 1:5.39.

Table 1: Showing the socio-demography of the study patients

Gender	Number of patients	Percentage (%)
Male	71	37.1%
Female	120	62.9%
Total	191	100.0%
Age category (years)		
21-30	50	26.2%
31-40	70	36.6%
41-50	33	17.3%
51-60	38	19.9%
Total	191	100.0%
Marital status		

	Single	43	22.5%
	Married	121	63.3%
	Widow/widower	15	7.9%
	Divorced	9	4.7%
	Separated	3	1.6%
	Total	191	100.0%
Educational status			
	None	1	0.5%
	Islamic	19	9.9%
	Primary	37	19.4%
	Secondary	83	43.5%
	Tertiary	45	23.6%
	Postgraduate	6	3.1%
	Total	191	100.0%
Occupation			
	Student	36	18.8%
	Civil servant	57	29.8%
	Artisan	27	14.1%
	Trader	58	30.4%
	Driver	10	5.3%
	Politician	3	1.6%
	Total	191	100.0%

Table 2: Showing the patients’ distribution along gender, age category and patient’s category (Insured/Uninsured)

Age category (years)	Male		Female	Total
	N(%)			
21 – 30	18 (9.4%)		32 (16.8%)	50 (26.2%)
31 – 40	23 (12.0%)		47 (24.6%)	70 (36.6%)
41 – 50	13 (6.8%)		20 (10.5%)	33 (17.3%)
51 – 60	17 (8.9%)		21 (11.0%)	38 (19.9%)
Total	71 (37.1%)		120 (62.9%)	191 (100.0%)
Insured patients	25 (13.1%)		41 (21.5%)	66 (34.6%)
Uninsured patients	46 (24.1%)		79 (41.3%)	125 (65.4%)

Table 3 Showing Pre-treatment Services among the subjects

Serial number	Pre-treatment services			Insured	Uninsured
		Yes (%)	No (%)		
	Radiological review	191 (100.0%)	0 (0.0%)	66 (34.6%)	125 (65.4%)
	Laboratory review	25 (13.1%)	166 (86.9%)	7 (3.7%)	18 (9.4%)
	Scaling and polishing	153 (80.1%)	38 (19.9%)	89 (46.6%)	64 (33.5%)
	Pre-treatment medications	100 (52.4%)	91 (47.6%)	46 (24.1%)	54 (28.3%)
	Post-treatment medications	91 (47.6%)	100 (52.4%)	36 (18.8%)	55 (28.8%)

Table 4: Showing patients’ distribution along treatment modalities among the subjects

Serial number	Treatment modalities	Insured patients	Uninsured patients	Total
	Sub-gingival scaling and root planning	-	28 (14.7%)	28 (14.7%)
	Operculectomy	2 (1.1%)	5 (2.6%)	7 (3.7%)
	Desensitization	-	-	-
	Indirect pulp capping	5 (2.6%)	13 (6.8%)	18 (9.4%)
	Root Canal Treatment	40 (20.9%)	25 (13.1%)	65 (34.0%)
	Apicectomy	-	3 (1.6%)	3 (1.6%)
	Extraction	19 (10.0%)	51 (26.7%)	70 (36.6%)
	Total	66 (34.6%)	125 (65.4%)	191 (100.0%)

Table 5: Showing treatment modalities by age categories among the patients

Serial number	Treatment modalities	Age groups (years)			
		21 – 30 Years	31 – 40 N(%)	41 – 50 Years	51 – 60 years
	Sub-gingival scaling and root planning	0 (0.0%)	2 (1.1%)	12 (6.3%)	14 (7.3%)
	Operculectomy	7 (3.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Desensitization	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Indirect pulp capping	5 (2.6%)	8 (4.2%)	2 (1.1%)	3 (1.6%)
	Root Canal	26 (13.6%)	30 (15.7%)	5 (2.6%)	4 (2.1%)

Treatment				
Apicectomy	2 (1.1%)	1 (0.5%)	0 (0.0%)	0 (0.0%)
Extraction	10 (5.2%)	29 (15.2%)	14 (7.3%)	17 (8.9%)
Total	50 (26.2%)	70 (36.6%)	33 (17.3%)	38 (19.9%)

Table 6: Showing direct medical cost of the treatment modalities among the patients

	N	N Insured	Per unit cost Insured	Total cost insured (₹)	N Uninsured	Per unit cost Uninsured	Total cost insured (₹)
Pre-treatment services							
Scaling&polishing	153	89	2,500	222,500	64	2,000	128,000
Radiology investigation	191	66	1,000	66,000	125	750	93,750
Laboratory investigation	25	7	500	3,500	18	350	6,300
			Total	292,000		Total	228,050
Extraction							
Retained root	11	3	5,000	15,000	8	3,500	28,000
Forcept extraction	50	13	2,500	32,500	37	1,500	55,500
Surgical extraction	9	3	8,000	24,000	6	7,000	42,000
			Total	71,500		Total	125,500

Preventive								
Subgingival scaling	28	-	-			28	2,000	56,000
Operculectomy	7	2	2,500	5,000	5	2,000	10,000	
			Total	5,000		Total	66,000	
Restorative								
De-sensitization	-	-	-	-	-	-	-	-
Indirect pulp capping	18	5	2,500	12,500	13	1,500	19,500	
RCT anterior	12	8	38,000	304,000	4	32,000	128,000	
RCT posterior	43	32	40,000	1,280,000	11	35,000	385,000	
Apicectomy	3	-			3	8,000	24,000	
				1,596,500			556,500	
			Total	1,965,000			976,050	

▪ Where N represent number of patients

Table 7: The cost-of-illness in managing a patient with toothache

		Insured (co-payment) (₦)	Uninsured(₦) Ratio
Direct medical cost			
	Service treatments cost	1,965,000:00	976,050:00
	Cost of medications	93,950:00	133,200:00
	Total	2,058,950:00	1,109,250:00
	<i>Patient's payment</i>	<i>205,895:00</i>	<i>1,109,250:001:5.39</i>
Direct non-medical cost			
	Transportation to and fro hospital =	49,250:00	49,250:00
	Number of recall visits transportation cost	7,800:00	7,800:00
	Total	57,050:00	57,050:00
Productivity losses cost	Total number of days lost = 207-days x 18,000naira (minimum wage)	124,200:00	124,200:00
COI		387,145:00	1,290,500:00
Average COI		5,865.83	10,324:00

DISCUSSION

Toothache experience has been reported to vary with gender, age, race, education attainment, family earning and social habits.^{11,16}Dental caries constituted the major cause of toothache as reported by other studies. The study revealed that more females (62.9%) sought treatment for toothache compared to their male counterparts in a ratio of 1.9:1.Females are known to seek healthcare services and are better health-informed than their male counterparts. This is in consonant with the reports by Omitola et al and Okunseri et al in Southern Nigeria. However, the above findings were contrary to reports from Azodo et al and Anyanechi et al who observed otherwise in Jigawa and Cross River states respectively. Majority of the patients were in age category 31-40-years which was similar to reports by Azodo and Anyanechi in relative environments. This may be related to increased consumption of cariogenic food substance as a

result of urbanization and adoption of western lifestyle.¹³ Majority of the patients had secondary school education and trading as occupation which may be unconnected with the urban location of the hospital and the state being a commercial hub in Northern Nigeria.

The cost of healthcare services has continued to increase worldwide thus posing concern for patients, clinicians, and policy makers as to whether it is possible to control costs while maintaining the quality of health care services. The study observed that patients who made out-of-pocket-payment were of higher percentage than insured (co-payment) patients. The high discrepancy between the direct medical cost of treatment between the insured and uninsured dental patients shows the huge financial burden shouldered by the uninsured. This can be attributed to limited coverage of the National Health Insurance Scheme or private sector insurance among most Nigerians. Hence the increased tooth fatality witnessed among 26.7% uninsured compared to 20.9% insured patients who saved their tooth through RCT treatment. This was seen in those less than 40 years who were more aesthetically concerned about their look and disposition.

CONCLUSION

The wide social gradient in the financial burden of managing toothache observed is not limited to the reference environment. Hence, there is need to improve access to dental care services through carefully planned universal National Health Insurance Scheme (NHI) to cover the states and local government workers. Also, there is need to incorporate oral healthcare services as a component of primary healthcare services which may help reduce these disparities among Nigerians.

Financial support and sponsorship Nil

Conflicts of interest There are no conflicts of interest.

REFERENCES

1. Goes, P.S.A. Watt, R.G. Hardy, R. Sheiham, A. Impacts of dental pain on daily activities of adolescents aged 14-15 years and their families. *Acta OdontScand* (2008): 66 (1): 7-12.
2. Macfarlane, T.V. Blinkhorn, A.S. Davies, R.M. Kincey, J. Worthington, H.V. Oro-facial pain in the community: prevalence and associated impact. *Commun Dent Oral Epidemiol* 2002; 30 (1): 52-60.
3. McMillan, A.S. Wong, M.C. Zheng, J. Luo, Y. Lam, C.L. (2010). Widespread pain symptoms and psychological distress in southern Chinese with orofacial pain. *J Oral Rehabil* 2010; 37: 2-10.
4. Wan, K.Y. McMillan, A.S. Wong, M.C. Orofacial pain symptoms and associated disability and psychosocial impact in community-dwelling and institutionalized elderly in Hong Kong. *Community Dent Health* 2012; 29: 110-6.

5. Noro, L.R.A. Roncalli, A.G. Mendes-Júnior, F.I.R. Costa de Lima, K. Teixeira, A.K.M. Toothache and social and economic conditions among adolescents in Northeastern Brazil. *Ciênc. saúdecoletiva* 2014; 19: 1.
6. Nuttall, N.M. Steele, J.G. Evans, D. Chadwick, B. Morris, A.J. Hill, K. The reported impact of oral condition on children in the United Kingdom. *Br Dent J* 2006; 200 (10): 551-555.
7. Cohen, L.A. Bonito, A.J. Akin, D.R. Manski, R.J. Macek, M.D. Edwards, R.R. Toothache pain: behavioral impact and self-care strategies. *Spec Care Dentist* 2009; 29: 85-95.
8. Ahlwardt, K., Heavilin, N. Gibbs, J. Page, J. Gerbert, B. Tsoh J.Y. Tweeting about Pain: Toothache compared to Backache, Earache, and Headache. *J Am Dent Assoc* 2014; 145 (7): 737–743.
9. World Health Organization. Oral Health. (2012). *Fact sheet No. 318*. 2012.
10. Omitola OG, Arigbede AO. Prevalence and pattern of pain presentation among patients attending a tertiary dental center in a southern region of Nigeria. *J Dent Res Dent Clin Dent Prospects* 2010; 4: 42-6.
11. Azodo, C.C. and Ololo, O. Toothache among dental patients attending a Nigerian secondary healthcare setting. *Stomatologija, Baltic Dental and Maxillofacial Journal* 2013; 15: 135-140.
12. Folayan, M.O. Chukwumah, N.M. Onyejaka, N. Adeniyi, A.A. Olatosi, O.O. Appraisal of the National response to the caries epidemic in children in Nigeria. *BMC Oral Health* 2014; 101: 25-29.
13. Sanu, O.O. Oredugba, F.A. Adebola, R.A. (2010). Oral and dental diseases among children and adolescents in Kano Nigeria. *J Braz Res Pediatr Dent Int Clin*. 10: 445-450.
14. Adeyemo, D.O. Local Government and Health Care Delivery in Nigeria: A Case Study. *J. Hum. Ecol* 2005; 18 (2): 149-160.
15. Bastos, J.L.D, Nomura, L. Peres, M.A. Dental pain, socioeconomic status and dental caries in young male adults from southern Brazil. *Cad Saude Publica* 2005; 21 (5): 1416-1423.
16. Tarricone, R. (2006). Cost-of-illness analysis; what room in health economics? *Health Policy* 2006; 77: 51–63
17. sBloom, B.S. Bruno, D.J. Maman, D.Y. Jayadevappa, R. Usefulness of US cost-of-illness studies in healthcare decision-making. *Pharmacoeconomics* 2001; 19 (2): 207–13.
18. Harford, J. and Spencer, A.J. Oral Health Perceptions. Australia’s Dental Generations: The National Survey of Adult Oral Health 2004–06, *AIHW Dental Statistics and Research Series No. 34*, pp.173–184.
19. Healthy Mouths, Healthy Lives: Australia’s National Oral Health Plan 2004–13. Prepared by the National Advisory Committee on Oral Health.
20. Jiang, H. Petersen, P.E. Peng, B. Tai, B. Bian, Z. Self-assessed dental health, oral health practices, and general health behaviors in Chinese urban adolescents. *Acta OdontolScand* 2005; 63 (6): 343-352.