

International Journal of Medicine and Medical Sciences

Volume 10 Number 1 January 2018

ISSN 2006-9723



*Academic
Journals*

ABOUT IJMMS

The **International Journal of Medicine and Medical Sciences** is published monthly (one volume per year) by Academic Journals.

The **International Journal of Medicine and Medical Sciences (IJMMS)** provides rapid publication (monthly) of articles in all areas of Medicine and Medical Sciences such as:

Clinical Medicine: Internal Medicine, Surgery, Clinical Cancer Research, Clinical Pharmacology, Dermatology, Gynaecology, Paediatrics, Neurology, Psychiatry, Otorhinolaryngology, Ophthalmology, Dentistry, Tropical Medicine, Biomedical Engineering, Clinical Cardiovascular Research, Clinical Endocrinology, Clinical Pathophysiology, Clinical Immunology and Immunopathology, Clinical Nutritional Research, Geriatrics and Sport Medicine

Basic Medical Sciences: Biochemistry, Molecular Biology, Cellular Biology, Cytology, Genetics, Embryology, Developmental Biology, Radiobiology, Experimental Microbiology, Biophysics, Structural Research, Neurophysiology and Brain Research, Cardiovascular Research, Endocrinology, Physiology, Medical Microbiology

Experimental Medicine: Experimental Cancer Research, Pathophysiology, Immunology, Immunopathology, Nutritional Research, Vitaminology and Etiology

Preventive Medicine: Congenital Disorders, Mental Disorders, Psychosomatic Diseases, Addictive Diseases, Accidents, Cancer, Cardiovascular Diseases, Metabolic Disorders, Infectious Diseases, Diseases of Bones and Joints, Oral Preventive Medicine, Respiratory Diseases, Methods of Epidemiology and Other Preventive Medicine

Social Medicine: Group Medicine, Social Paediatrics, Medico-Social Problems of the Youth, Medico-Social Problems of the Elderly, Rehabilitation, Human Ecology, Environmental Toxicology, Dietetics, Occupational Medicine, Pharmacology, Ergonomy, Health Education, Public Health and Health Services and Medical Statistics The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published approximately one month after acceptance. All articles published in IJMMS are peer-reviewed.

Contact

Editorial Office: ijmms@academicjournals.org

Desk: helpdesk@academicjournals.org

Website: <http://www.academicjournals.org/journal/IJMMS>

Submit manuscript online <http://ms.academicjournals.me/>

Editors

Dr. J. Ibekwe

*Acting Editor-in-chief,
International Journal of Medicine and Medical
Sciences Academic Journals
E-mail: ijmms.journals@gmail.com
<http://www.academicjournals.org/ijmms>*

Afrozul Haq

*Editor, Laboratory Medicine
Department of Laboratory Medicine
Sheikh Khalifa Medical City
P.O. Box 51900, ABU DHABI
United Arab Emirates*

Editorial Board

Chandrashekhar T. Sreeramareddy

*Department of Community Medicine,
P O Box No 155, Deep Heights
Manipal College of Medical Sciences,
Pokhara,
Nepal*

Sisira Hemananda Siribaddana

*259, Temple Road, Thalpathpitiya,
Nugegoda, 10250
Sri Lanka*

Dr. santi M. Mandal

*Internal Medicine
UTMB, Galveston, TX,
USA*

Konstantinos Tziomalos

*Department of Clinical Biochemistry
(Vascular Prevention Clinic),
Royal Free Hospital Campus,
University College Medical School, University College
London, London,
United Kingdom*

Cyril Chukwudi Dim

*Department of Obstetrics & Gynaecology
University of Nigeria Teaching Hospital (UNTH)
P.M.B. 01129, Enugu. 400001,
Nigeria*

Mojtaba Salouti

*School of Medical and Basic Sciences,
Islamic Azad University- Zanjan,
Iran*

Imtiaz Ahmed Wani

*Srinagar Kashmir, 190009,
India*

Professor Viroj Wiwanitkit

*Wiwanitkit House, Bangkhae,
Bangkok
Thailand 10160*

Dr. Srinivas Koduru

*Dept of Clinical Sciences
Collage of Health Sciences
University of Kentucky
Lexington USA*

Weiping Zhang

*Department of Oral Biology
Indiana University School of Dentistry
1121 West Michigan Street, DS 271
Indianapolis, IN 46202
USA*

Lisheng XU

*Ho Sin Hang Engineering Building
Department of Electronic Engineering
The Chinese University of Hong Kong
Shatin, N.T. Hong Kong,
China*

Dr. Mustafa Sahin

*Department of Endocrinology and Metabolism
Baskent University,
Ankara,
Turkey*

Dr. Harshdeep Joshi

*Maharishi Markandeshwar
Institute of Medical Sciences and Research
Ambala, (Haryana).
India.*

ARTICLES

Health service delivery in selected municipalities in Leyte: Inputs for improved health service delivery	1
Miguel E. Mangada	
The value of C–reactive protein in the diagnosis of septicaemia in children with malaria	9
Emmanuel Eyo Ekanem, Ador John Uniga, Cosmas Akataekwe Obiora, Angela Ekanem Oyo-Ita, Helena Martin Omang	
Descriptive analysis of neoplasias diagnosed as pleomorphic adenoma (PA) that presented at the University of Nigeria Teaching Hospital Ituku-Ozalla Enugu	14
James Onuorah Akpeh, Uchenna Chukwuemeka Okechi, Kenneth Amaechi Agu and Basil Chukwuemeka Ezeanolue	

Full Length Research Paper

Health service delivery in selected municipalities in Leyte: Inputs for improved health service delivery

Miguel E. Mangada

University Parkway Drive, STI College Global City, Fort Bonifacio, Taguig City, Philippines.

Received 8 May, 2015; Accepted 24 November, 2017

Utilizing descriptive research design, this study investigated the nature and implementation extent of service delivery related to reproductive health (RH) and tuberculosis (TB) control. Data were gathered using existing data files, survey checklist questionnaires and interview schedule. The questionnaires were pilot-tested then implemented on actual respondents. Findings showed there was adequate number of needed personnel in all rural health units (RHUs) with the appropriate educational qualification, eligibility and training. Facilities and materials available were functional and most often used. Most health service delivery units have no specific allocation earmarked for TB control and RH programs. Information dissemination techniques were one-on-one session and lecture during check-up. Linkage with either one or two NGOs among the RHUs existed, but, none of such linkage existed between NGO and the two hospital facilities. The health service delivery profile in RHUs and hospitals is adequate in terms of personnel number and experts' availability. Inadequacy of facilities and scarcity of information materials were noted. Legal mandates were partly enforced together with implementation of health service delivery related to TB control and reproductive health programs. There was no extent of linkages of local government units. Gaps and overlaps in health service delivery for the two programs were evident.

Key words: Health service delivery, tuberculosis control, reproductive health, local government units, non-government organizations.

INTRODUCTION

Health service delivery is one the major concerns of the state. As stipulated in Art. II, Section 15 of the 1987 Philippine Constitution, the state is mandated to promote people's health (De Leon, 2003). Indeed, government incurs much expense in the prevention and containment of diseases. In like manner, it requires so much

investment in both human and capital resources in curtailing diseases that continue to plague our society such as tuberculosis, and reproductive health.

The government, therefore, had to organize the Department of Health (DOH) which is primarily tasked monitoring and controlling the implementation of national

E-mail: migman_one@yahoo.com.

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](http://creativecommons.org/licenses/by/4.0/)

health programs. The creation of local units was viewed as a mechanism that can make the delivery of health services percolate to the barangays (Bustos, 1993). Barangays here would mean a geographical subdivision which is considered the smallest subdivision in Philippine geography.

With reference to the effects of the pre-devolution health service delivery, the Department of Health, National Epidemiology Center (Philippines)(2000) stipulates that even if health outcomes in the country have significantly improved, there are still so many challenges of the health delivery system, risk and financial protection with reference particularly to the poor and marginalized sectors of the society. It is further indicated that notwithstanding the significant containment of many diseases by reason of health technology and advances in science, most Filipinos are not able to access appropriate health services. Such a situation is attributable to physical, social and financial barriers.

It is further posited that even in instances where health facilities are available, people continue to find difficulty in accessing health services because they are beyond their financial capability. There is lack of quality care or the providers of health services cannot respond effectively to the health needs of the people.

Hernandez et al. (1993), citing the findings of a 1984 World Bank review analysis, found out that the Philippine health delivery system was excessively centralized, with fragmentation and duplication existing between central and field units. There were also observable weak linkages between rural programs and centrally-run disease specific campaigns.

Grundy et al. (2003) summarized the state of health during the pre-devolution era as characterized by: a) high fertility levels resulting in a rapid population growth; b) a declining mortality, but, with tuberculosis as the leading cause of morbidity and mortality; c) declining mortality rate, though the decline was not comparable to that of neighboring countries; and maternal deaths related to pregnancy and maternal births contributing 14% of all deaths of women aged 15 to 49.

Gleaning from the theoretical views cited, a conceptual framework was developed which sheds light on the scope of the study. The conceptual paradigm indicates that this study will investigate specific areas provided by the local government health units and the extent of health service delivery involving two health concerns, namely: reproductive health and tuberculosis control which will serve as input data in order to suggest improvement of the health service delivery in selected municipalities of the Philippines: a) The profile of the health delivery system of the local government units involved the study with respect to: a.1) Adequacy of personnel, expertise, facilities, finances, information dissemination, a.2) Extent of enforcement of legal mandates; and a.3) Existence of linkages with non-governmental organizations; b.)

Perceived level of implementation of health service delivery with regard to the following programs: b.1) reproductive health and b.2) control of tuberculosis; c) Gaps in health service delivery in terms of: c.1) personnel; c.2) expertise; d.3) facilities; d.4) finances; c.5) information dissemination; c.6) extent of enforcement of legal mandates; and c.7) existence of linkages with non-government organizations, and d) Overlaps in health service delivery in terms of: d.1) personnel; d.2) expertise; d.3) finances; d.4) information dissemination; d.5) extent of enforcement of legal mandates; d.6) existence of linkages with non-government organizations.

The different drawbacks, gaps and inadequacies in the matter of health service delivery performance during the pre-devolution era serve to underpin the need to institutionalize the devolution of health service delivery.

In the case of Region VIII, the Department of Health (2007), points out that of the ten leading causes of morbidity, 50% are communicable in nature. The same report further points out that in 2006, acute respiratory infections remained the top leading causes of morbidity in the region and tuberculosis still ranked 7th in morbidity rate as compared to 2005. An earlier report (National Tuberculosis Program, 2002) also indicates that of the total population of 79,503,675, the number of tuberculosis cases reached 123,208. Region VIII had 5,516 cases and Northern Leyte had 1,627 cases.

Concerning reproductive health (RH), Friedman (1993); Ainsworth and Over (1994), as cited in World Health Organization (1995), pointed out that approximately one third of the world's population is between 20-24 years of age, and four out of five young people live in developing countries. This figure is expected to increase in year 2020. It was further cited that in several countries, majority of the young people have sexual experience by age 20.

Reproductive health primarily connotes the right to remain free of disease, disability or death associated with sexuality and reproduction. It is a major component of women's health (Department of Health, 2007). Specific facts relating to reproductive health in Region VIII serve to justify the conducting of a study pertaining to this aspect of health service delivery. For example, in 2006, there were 81 maternal deaths reported, with complications related to labor, delivery and puerperium. Post partum hemorrhage and hypertension in pregnancy were the top two major causes of maternal mortality (Department of Health, National Epidemiology Center, (Philippines) (2006).

The previously quoted data highlight the inadequacies of various aspects of health dispensation in the pre-devolution era. In general, there were weaknesses in the area of structure, governance, financing and overall health delivery. As already cited, the inadequacies in specific aspects include persistent high fertility levels, continuing rise in population and rising mortality,

particularly, infant and maternal mortality. A worsening situation is observable in relation to the containment of communicable diseases, specifically, tuberculosis.

Further, the quoted data point out that devolution has been resorted to in order to bring about improvement in health delivery performance. Notwithstanding the implementation of devolution, however, various aspects of the program remain defective.

The health delivery program continues to be plagued by problems such as the backlog in capital spending, poor availability of drugs, and breakdown in referral system, declining hospital quality, ineffective delivery mechanism and inadequate facilities, among others. Also, specific health problems persist despite devolution, particularly with regard to high fertility rate, child and maternal deaths and incidence of tuberculosis. These problems continue to beset Eastern Visayas, which necessarily include the province of Leyte. Devolution is the transfer of powers and authority from the national government to the local government units.

The aforementioned data indicative of poor health delivery performance in the Philippines, in general, and in Region VIII in particular, provide the rationale for the choice of this study. Further, the continued existence of the health problems, namely, high fertility rate, which engenders continued rise in population, maternal and child mortality and the continued incidence of tuberculosis, despite disease control, serve to provide the rationale for the inclusion of these two health problems in the present study.

METHODOLOGY

This study is descriptive in nature. It required gathering of data utilizing existing data files, survey questionnaire, survey-checklists, individual interviews and focus group discussions. Quantitative data gathered from different research instruments was corroborated by qualitative data gathered from the interviews and focus group discussions, documentary analysis and questionnaire.

Respondents of the study are: a) implementers; b) selected patients; and c) selected members of non-government organizations. The number of respondents distributed according to categories, manner of selection as well as the information they expected to give are based on the statement of the problem. The study involved: a) implementers of the health service delivery which include the doctors, nurses, medical technologists, midwives, sanitary inspectors, b) selected patients and c) selected members of non-government organizations.

A permit to conduct the study was sought from the Regional Director of the Department of Health of the Philippines. A copy of which was given to the chiefs of 2 hospitals and Municipal Health Officers of three rural health units (RHUs).

The pertinent existing data files were analyzed in order to determine the profile of the health service delivery of the local government units in terms of a) adequacy of personnel, expertise, facilities, finances, information dissemination; b) extent of legal mandates, and c) extent of linkages with non-government organizations.

Location of the study

This study was conducted in three selected municipalities in the Philippines using a purposive sampling technique.

Data processing and analysis

Frequency counts, means and percentages were computed to determine the profile of the health service delivery of the local government units in terms of variables included in the study for a) adequacy of personnel, expertise, facilities, finances, adequacy of information dissemination, existence of enforcement in the implementation of legal mandates, existence of linkages with nongovernment organizations and existence of cooperation between and among the health service delivery units; b) the perceived level of implementation of the health service delivery along the different aspects of TB control and reproductive health; and c) gaps and overlaps in the delivery of health services.

RESULTS AND DISCUSSION

On the basis of the gathered data, the study findings can be summarized as follows:

Adequacy of personnel in two selected hospitals

All the needed health personnel in each hospital facility are very adequate in terms of number. In the case of the Provincial Hospital at Palo, Leyte, the employment of 11 physicians is very much bigger than what is required under DOH standard of physician per 20 beds anytime plus one reliever. In the case of nurses, the DOH requirement of having one nurse per 12 bed capacity among level, in the hospital is more than satisfied due to the fact that 10 nurses plus three other nurses hired on a casual basis are employed in this hospital facility. The hiring of one medical technologist is inadequate as the requirement is one medical technologist per 24 bed capacity, which should be one physician per 20 beds.

A similar situation was observed in Carigara District Hospital in terms of adequacy of personnel. A very adequate number of nursing attendants and medical technologists are also observed as compared to the DOH standards. The presence of a very adequate number of health workers implies that the hospital can attend to the needs of several clients promptly. However, the limiting factor of lack of facilities may still stifle the dispensation of a better health service delivery to the catchment area even if there is adequacy of personnel.

Adequacy of expertise of the RHU personnel in TB control and reproductive health

Adequacy of expertise of the RHU personnel in TB control indicates that the medical doctors, nurses and

midwives hired in all the three rural health units and the medical technologist hired in Palo RHU and Sta. Fe RHU, respectively possess the needed appropriate education and eligibility and have undergone the appropriate training in TB control. The sanitary inspector hired in all RHUs does not have the appropriate educational qualification and eligibility, as each is either a graduate in engineering or rural development. This situation can be explained by the fact that the Department of Health does not require that the position of a sanitary inspector be occupied by a sanitary engineering graduate as long as the said health worker undergoes the relevant training. In the case of both Palo RHU and Sta. Fe RHU, the sanitary inspector has the appropriate training.

Adequacy of facilities/materials available in RHUs

In the case of Carigara RHU, only three facilities/materials are not available, namely: chest X-ray machine, TB ward and medicine for TB. In the case of Palo RHU, only chest X-ray machine and TB ward are not available.

Concerning the functionality of facilities/materials, IEC materials are only sometimes used in all the three RHUs. Microscopy area is only sometimes used in Carigara RHU, and never used in Palo RHU. IEC means Information, Education and Communication materials.

Further, the data gathered from the group focus interview reveal that one main problem concerns the availability of medicines. In the case of Carigara RHU, the respondents indicate that they do not have an idea regarding medicines because these are managed by the Mayor's office. Also, medicines from nongovernment organizations are made available as donations. In the case of Palo, Leyte, some medicines for tuberculosis are provided by the Department of Health. In Sta. Fe, some medicines are provided by the Department of Health. It is further indicated that information materials are limited in quantity and are often neglected in favor of other needs once additional resources are secured.

In relation to medication for illness, the collected data indicate that it is not available in both hospitals. Whereas, contraceptive pills are not available in Carigara District Hospital only. The available facilities/materials, are either often or sometimes used. The availability of contraceptive pills for distribution to clients is important in the success of reproductive health. The data mentioned earlier stated the need for making available other materials such as condom and other contraceptives for distribution to users. The use of IEC materials can greatly help in attaining the program of reproductive health. For instance, the display of posters in conspicuous places can help put across the message of the importance of family planning.

Regarding adequacy of facilities/materials in reproductive health in the hospitals, the absence of

certain facilities can bring about negative effects in relation to health service delivery, particularly, the control of tuberculosis. For example, the absence of a chest X-machine can hinder the more thorough detection of tuberculosis among individuals. Referrals to private laboratory clinics may not prove effective when the poor cannot afford the charges. Lack of sufficient supply of medicines can result in a situation wherein the clients are given only prescriptions but have to buy the medicines themselves. Those who cannot afford the said medicines will not be expected to get cured. Lack of information materials on the mode of transmission of the disease, and the needed steps to be followed once the individual suspect contamination will result in the continued rise of tuberculosis patients.

In relation to RH among the RHUs, one facility like the surgical room/delivery room is not available. Contraceptive pills are not available in both Carigara and Sta. Fe RHUs. For functionality, medication for management of illness has the lowest functionality in two RHUs (Carigara RHU and Sta. Fe RHU). In the case of contraceptive pills that are available in Palo RHU, its functionality is also low (10%). For regularity of use of the available facilities/materials, in Palo RHU, all the said facilities/materials are only sometimes used. In the case of the two other RHU₂, the facilities/materials are either sometimes or often used.

For functionality of the different available facilities/materials, some facilities are no longer functional such as a) microscope, face masks, sputum containers and gloves in the case of Sta Fe RHU; b) medicines in Palo RHU; and c) IEC materials in all RHUs. In terms of regularity of use of the facilities/materials, a) in the case of Carigara RHU, almost all available facilities/materials are always used; sputum containers and medical gloves are sometimes used and IEC materials are never used; b) in the case of Palo RHU, most of the materials/facilities are never used, except cotton and weighing scale that are always used; microscope and glass slides are seldom used.

In the case of two hospitals, a) all the facilities/materials are available, except medicines for TB which are not available in both hospitals; b) the available facilities, materials, TB ward and IEC are not functional in both hospitals as well as area for microscopy, in the case of Carigara District Hospital; c) with the regularity of use, most of the available facilities/materials are either sometimes or often used, with only two materials (cotton and alcohol) identified as always used. In the case of Palo Provincial Hospital, all available materials were used sometimes.

The findings on unavailability of some facilities/materials are in consonance with the findings cited by Grundy et al. (2003) pointing to the fact that the present level of state of disrepair of government health facilities and equipment underscore fund inadequacy.

Adequacy of finances for TB control and RH

It is worthy to note that Carigara RHU and Palo RHU have a proposed budget for TB control and reproductive health. However, the three do not have actual three RHU allocations for the two health services, even as the amount of proposed allocation for Carigara RHU and Palo RHU, the corresponding respondents perceived the proposed allocation as inadequate. This was also the perception of respondents for the two hospitals. The three local government units do not have actual RHU allocations.

The availability of fixed budgetary allocation is needed for the successful implementation of any health program including tuberculosis control and reproductive health. In the first place, such sufficient budgetary allocation is needed in buying certain materials such as those needed in the early detection of tuberculosis and in purchasing medicines and contraceptive pills. The IEC materials need to be provided by the RHU in order to respond to the need of proper information dissemination in both programs.

Adequacy of information dissemination on TB control

The frequency of use of the one-on-one session, and lecture during check up, the most common modes used to disseminate health information, ranges from sometimes used to always used. The radio, seminar and assembly are never used in all health service delivery units. The use of one-on-one interaction can prove effective in the sense that the health officer can be assured that the client is listening intently to the discussion and is made to understand more clearly the topic discussed by allowing clarified questions. However, this has the disadvantage of having a very limited target population. Only those who go to the RHU can be given information concerning RH and TB control. The use of mass media such as having a radio program can reach the greater number of people even reach the whole region.

As revealed, three municipalities rely heavily on whatever is given out by the DOH. The said Local Government Units (LGUs) reproduce the said materials so as to distribute them to the villagers. However, this effort is hindered by budgetary constraints. These methods of information dissemination range from sometimes used to always used. Never used in all health service delivery units are radio, television, seminar and assembly.

Extent of implementation of legal mandates

All legal mandates are softly implemented, except:

Administrative Order No. 79, series of 2001 and Department Order No. 2 – 6, s.1993 (Voluntary Contraceptive Project of PPP) which is not implemented in Carigara RHU. No legal mandate is fully implemented.

The extent of implementation of legal mandates can have effect on the degree to which program objectives are carried out. In the first place, the mandate of each law forms part of the goals of health service delivery. These laws set the timetable for implementation, and evaluation of the program. In specific instances, the legal mandates provide punishment for nonfeasance.

With regard to the implementation of the legal mandates on TB control: a) there is full implementation of the two laws in only one RHU, the Palo RHU, but with level of implementation in the other health service delivery units; b) as the legal mandate on reproductive health, most of the laws are partially implemented. Two laws are fully implemented while four laws are not implemented at all.

Existence of linkages with NGOs

The data show that on RHU, the Sta. Fe RHU does not have linkage with any NGO. Only the Carigara RHU has a linkage with two NGOs: namely, Culion and Vision. Both hospital facilities do not have linkage with any NGO. Establishing linkage with non-government organizations pertinent to health service delivery is vital. For one thing, sole reliance on government for inputs that are vital for health service delivery such as financing, facilities and other needed materials can prove inadequate. In other words, the government does not have the full financial capability to support all these requisites for successful health service delivery. Such linkages can also be helpful in developing skills of health workers through programs of in-service training or even providing scholarship grants. Hence, lack of stronger linkages with non-government organizations implies lesser access to more needed requisites for implementing health service programs. In the case of the two municipalities: namely, Carigara and Sta. Fe, linkage with only one non-government organization, though, expectedly beneficial to efforts at tuberculosis control, such a program can be further strengthened and made more active if more non-government organizations deny the health delivery units of the benefits gained from maintaining close ties with non-government organizations in the two health service programs.

There is linkage with an NGO of all three RHUs. However, one RHU (Sta Fe) has a linkage with a second NGO. The hospitals don't have a linkage with any NGO.

Existence of cooperation between and among health service delivery units

Cooperation among the RHUs with regard to both TB

control and RH exists; a) between the RHUs and Carigara District Hospital; b) between the RHUs and Palo Provincial Hospital and c) between Carigara District Hospital and Palo Provincial Hospital. Among the health service delivery units, the presence of cooperation in the matter of health service delivery is important. Firstly, cooperation can be translated in terms of sharing of facilities. This means that one health delivery unit can allow the use of such facilities only to respond more adequately to client needs. Secondly, expert personnel from other health delivery units can help improve the health services of other units. Similar advantages can be expected when the service delivery units engage in sharing of medicine and more importantly, once feasible, finances.

Level of implementation of the different aspects of the program on TB control and reproductive health

All the different aspects of TB control are partially implemented, except for a) X-ray, which is not implemented in Sta. Fe RHU; b) Hospitalization in excessive cases which is not implemented in Carigara RHU and Sta. Fe RHU. No aspect of the TB program is fully implemented. The performance of all activities included in tuberculosis control from case finding to hospitalization is vital to a successful TB control program. Partly implementing direct sputum microscopy in two municipalities implies that some persons cannot be fully identified as contaminated with the contagious disease, more particularly so because of the absence of chest X-ray machine. Resorting to referral to the Eastern Visayas Regional Medical Center or the Provincial Hospital can mean accompanying the patients so as to be sure that the patients really go for TB treatment. Merely giving the person the referral sheet may not assure reporting to the health service delivery unit referred to in the referral letter, thus, resulting in failure in case finding. Going to private laboratory for direct sputum smear microscopy and chest X-ray can be prohibitive in terms of cost to the detriment of the patient. Full implementation on a municipality-wide basis of health education on TB control is also important in order to avoid TB spread. Hospitalization of patients with extensive TB infection can lessen the extent of contaminations at home and can lead to patient's recovery. Excessive cases here mean that some hospitals even if the patient's tuberculosis is severe, they do not confine the patients rather, they send home the patient and is treated at home instead of being treated in the hospital facility.

In the case of the program on reproductive health, all aspects are partially implemented in all health service delivery units. The data underscore the need to fully implement the other activities for more successful health service delivery with respect to RH. For instance, counseling on reproductive health, and family planning

are a must in responsible sex behavior. Promotion of safe sex can avoid unwanted pregnancies among married couples. Knowledge on sexually transmitted diseases can result in sex avoidance. Case finding and management of reproductive tract infections can help avoid the occurrence of more serious illnesses such as tumors, AIDS/HIV and other sexually transmitted diseases.

Gaps in the delivery of services in relation to reproductive health

The following were identified as overlaps in the delivery of health services: a) The excess of number of personnel namely, a.1) midwives in the case of all the three RHUs; a.2) 1 sanitary inspector in Palo RHU; a.3) medical doctors and nurses in the case of the two hospitals involved in the study; a.4) nursing attendants in the case of Carigara District Hospital; b) Case finding of TB patients in all health service delivery units; c) Procurement of medicines by the Mayor's office in all RHUs; d) Linkage of the RHUs to the same NGO.

Certain gaps in the delivery of health services have been identified such as: a) lack of specific health personnel in all RHUs and one health personnel in Palo Provincial Hospital; b) non-availability of certain materials/facilities such as chest X-ray machine and TB ward in all RHUs and drugs for both TB control and reproductive health in all service delivery units; c) absence of budgetary allocation for both programs; d) lack of information dissemination materials also for both programs in all service delivery units; e) inadequate or absence of linkage(s) with NGOs; f) absence of cooperation in the enforcement of legal mandates.

Overlaps in the delivery of services

Specific overlaps in the delivery of health services were likewise identified: a) excess number of certain health personnel, namely 1) midwives in all RHUs; a.2) sanitary inspector in Palo RHU; a.3) medical doctors and nurses in the two hospitals; and a.4) nursing attendants in Carigara District Hospital; b) case finding of patients in all health service delivery units, which should have been delegated to lower health service delivery units; c) procurement of medicines in all RHUs by the Mayor's Office; and d) linkage of the RHUs to the same NGO.

Conclusion

It can be inferred from this study that although the RHUs have some health personnel which are either very adequate or adequate in number, they still suffer from inadequacy of a number of specific health personnel or in the case of the two RHUs, unavailability of one personnel.

A very adequate number of health personnel are hired in both Carigara District Hospital and Palo Provincial Hospital. However, in the case of some specific health personnel, the number of health personnel hired is more than what is required under the Department of Health standards, hence, for purposes of this study, such a situation is regarded as an overlap in the delivery of health services. For adequacy of expertise in TB control, the medical doctors, nurses, midwives in all RHUs and the medical technologist have the adequate education, eligibility and training. However, the sanitary inspector does not have the appropriate educational qualification in all RHUs and does not have the appropriate training in one RHU. In the two hospitals, the medical doctors, nurses and medical technologists have the appropriate qualification and eligibility but not all of them have trainings in TB control. In Carigara District Hospital, the nursing attendants are professionals, having eligibility and training in TB control. The nursing attendants in Palo Provincial Hospital are professionals having civil service eligibility. However, not all of them have training in TB control.

There is adequacy of expertise in the three RHUs concerning reproductive health with reference to the following health personnel: medical doctors, nurses and midwives as well as the medical technologists in Palo and Santa Fe RHUs. Such adequacy of expertise is required in the case of the sanitary inspectors in all three RHUs.

In the case of the two hospitals, the adequacy of expertise is hindered by the fact that not all medical doctors and nurses, and nursing attendants have training in reproductive health. For the RHUs, the adequacy of facilities on TB control is hindered by the lack of chest X-ray machines and TB ward in all RHUs and the nonavailability of medicines in Carigara and Santa Fe RHUs; the nonfunctionality of IEC materials in all the three RHUs; microscopes, sputum containers and medical gloves in Santa Fe RHU; and medicines in Palo RHU; the nonuse of certain facilities/materials in specific RHU such as IC materials in Palo RHU and most facilities/materials in Palo RHU.

There is availability of all needed facilities/materials for TB control in both hospitals. However, the two hospitals vary in terms of functionality and regularity of use of the said facilities: a) In Carigara District Hospital, nine of the facilities are either always or often used while five facilities/materials are sometimes used. Chest X-ray machine is never used; b) In Palo Provincial Hospital, only two facilities, the IEC materials and TB ward are not functional. The rest are functional. The facilities are only sometimes used. With regards to the adequacy of facilities for reproductive health, a) certain facilities are not available in the three RHUs, namely the surgical room; b) contraceptive pills are available only in Palo Provincial Hospital and Palo RHU; c) The rest of the

materials, however, are available in all the RHUs. For functionality of facilities, most of them are functional in all three RHUs, except IEC materials and physical examination materials that are not functional in Palo RHU. With regards to regularity of use a) In Santa Fe RHU, they are always used; b) In Carigara RHU, only the room for counseling is always used; c) The IEC materials are never used.

With regards to the adequacy of facilities in two hospitals: a) some materials are not available in both hospitals, namely IEC materials; b) Contraceptive pills are not available in Carigara District Hospital; c) The other materials/facilities are available in both hospitals; b) Contraceptive pills that are available in Palo Provincial Hospital are nonfunctional; and c) The rest of the available facilities are functional in both hospitals. With regards to regularity of use of the said facilities : a) Room for counseling and physical examination materials are always used in Carigara District Hospital; In Palo Provincial Hospital, the physical examination room is often used.

With regards to adequacy of information dissemination on TB control, the most common methods used in the three RHUs are one-on-one session and lecture during check-up. For regularity of use: a) In Carigara RHU, the lecture during check-up is always used; b, In Palo RHU, both the one-on-one session and lecture during check-up are only sometimes used; c) In Santa Fe RHU, both methods are always used. In the two hospitals, there is nonuse of all materials and information dissemination. With regards to adequacy of information dissemination of reproductive health delivery: a) one-on-one session and lecture during check-up are frequently used in all health service delivery units. There is nonuse of the other materials/methods.

Concerning the extent of implementation of legal mandates on TB control: a) There is full implementation of the two laws in Palo RHU. In the other health service delivery units, the extent of implementation of the two laws ranges from no implementation to partial implementation. With regard to reproductive health: a) Most of the laws are partially implemented in all health service delivery units; b) Some laws, however, are not implemented. There is a linkage between the three RHUs and one non-government organization. The two hospitals do not have any linkage with a nongovernment organization. There is existence of cooperation in relation to health service delivery: a) Among the RHUs and the two hospitals, and b) between the Carigara District Hospital and the Palo provincial Hospital.

Gaps in the delivery of health services

Lack of certain health personnel, these are as follows: 1) 1 medical doctor in Carigara RHU; 2) 1 nurse in Palo RHU; 3) 1 sanitary inspector in Carigara RHU; 4) 1

dentist in Carigara RHU and Palo RHU; 5) 2 medical technologists in Carigara RHU both Palo RHU and Santa Fe RHU; and 6) 1 medical technologist in Palo Provincial Hospital.

The following recommendations can serve as inputs that could be used to improve the health service delivery in relation to tuberculosis control and reproductive health:

1. Increase in the number of nurses in the Rural Health Units to meet the Department of Health standards.
2. Hiring a permanent medical technologist in every RHU for early detection or case finding of would-be tuberculosis in every municipality is more effective. This is so because the rural health workers are in a better position to identify specific households that could have a possible problem of TB contamination.
3. In each of the municipalities having no sanitary inspector at the moment, a sanitary inspector with health-related educational background must be hired. For those municipalities having sanitary inspector at present, more trainings should be conducted particularly in relation to the programs on TB control and reproductive health.
4. Procurement of an X-ray machine in every municipality. In this manner, case finding or detection of TB and problems related to reproductive health can be more immediate and would involve a wider area or base. Referrals to higher delivery units such as the Provincia Hospital or the eastern Visayas Medical Center would not be necessary anymore. Poor clients can access such a service without additional expenses in coming to the city for the case finding or detection of TB cases. Also, provision a TB ward in each rural health unit.
5. Each municipality should have an information dissemination committee to take charge of procurement/production of needed IEC materials for use in a more aggressive campaign for TB control and reproductive health.
6. Conducting a yearly or quarterly seminar-workshop so as to upgrade the understanding of health personnel relative to the legal mandates pertaining to TB control and reproductive health. The legal mandates should be classified such that instead of having multilevel implementation of all the legal mandates, each health service delivery unit takes charge of specific legal mandates, the implementation of which would be its major responsibility within the catchment area. Strict monitoring of the implementation of the legal mandate must be conducted by the Department of Health.
7. More thorough monitoring of the implementation of the activities included in both TB control and reproductive health must be done. Incentives for outstanding performance can be extended to specific delivery units. Cooperation in terms of personnel and expertise must be encouraged. The Department of Health must organize a pool of experts in the area of TB control and reproductive

health, whose services can be easily accessed by service delivery in need of specific field of expertise.

8. There must be an agreement among the health service delivery units to allow easier access to facilities that are available and which have been found to be very useful in the programs of TB control and reproductive health.

9. The Rural Health Officer must make representation with the City or Municipal Mayor, Governor and Congressman, so as to make possible, the allocation of specific budget for TB control and reproductive health. At the national level, an agreement can be made between the Department of Health and Department of Interior and Local Government so as to have a permanent allocation for health services at the local level.

10. The health service delivery units must have wider contacts with other non-government organizations.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

- Ainsworth M, Over M (1994). AIDS and African Development. World Bank Research Observer 9(2):203-240.
- Bustos AC (1993). Rules and regulations implementing the local government code of 1991. Manila: A.V.B. Printing Press. P 311.
- De Belen (2003). Implementation of Health Services in Devolved Cities and Municipalities in the Philippines. Journal of Public Administration. University of the Philippines College of Public Administration. UP Diliman, Quezon City, Philippines.
- Department of Health, National Epidemiology Center, (Philippines) (2006). Philippines Field Health Service Information System (FHSIS) Annual Report 2006. Manila, Philippines: National Epidemiology Center, Department of Health (Philippines). Available at: <http://ghdx.healthdata.org/record/philippines-field-health-service-information-system-fhsis-annual-report-2006>
- Department of Health, National Epidemiology Center, (Philippines) (2000). Philippines Field Health Service Information System (FHSIS) Annual Report 2000. Manila, Philippines: National Epidemiology Center, Department of Health (Philippines). Available at: <http://ghdx.healthdata.org/record/philippines-field-health-service-information-system-fhsis-annual-report-2000>
- Friedman HL (1993). Overcoming Obstacles to Good Adolescent Health. Network 14(2):4-5.
- Grundy J, Healy V, Gorgolon L, Sandig E (2003). Overview of Devolution of Health Services in the Philippines. Rural Remote Health 3(2):220.
- Hernandez DJ (1993). America's children. New York: Russell sage foundation. Herrins, A.N., A. de la Paz Kraft, O.F. Picazo, O.C. Solon, M.M. Taguiwalo, and M.S. Zingapan. 1993. Health sector review: philippines. HFDP Monograph 3. Manila: Department of Health and Health Finance Development Project. Available at: [https://books.google.com.ng/books?id=cuU4vGeyduwC&pg=PA466&lpg=PA466&dq=Herrin+AN,+Kraft+A,+Picazo+OF,+Solon+OC,+Zingapan+MS+\(1993\).+Health+Sector+Review.+Health+Finance+Development.+Monograph,+3.&source=bl&ots=TKVDDpM7At&sig=v45ohrYSDeX7OcNxiHZTglb32LI&hl=en&sa=X&ved=0ahUKEwinOLKTq53YA hUQJ1AKHWh-ChoQ6AEIJDA#v=onepage&q=Herrin%20AN%2C%20Kraft%20A%2C%20Picazo%20OF%2C%20Solon%20OC%2C%20Zingapan%20MS%20\(1993\).%20Health%20Sector%20Review.%20Health%20Finance%20Development.%20Monograph%2C%203.&f=false](https://books.google.com.ng/books?id=cuU4vGeyduwC&pg=PA466&lpg=PA466&dq=Herrin+AN,+Kraft+A,+Picazo+OF,+Solon+OC,+Zingapan+MS+(1993).+Health+Sector+Review.+Health+Finance+Development.+Monograph,+3.&source=bl&ots=TKVDDpM7At&sig=v45ohrYSDeX7OcNxiHZTglb32LI&hl=en&sa=X&ved=0ahUKEwinOLKTq53YA hUQJ1AKHWh-ChoQ6AEIJDA#v=onepage&q=Herrin%20AN%2C%20Kraft%20A%2C%20Picazo%20OF%2C%20Solon%20OC%2C%20Zingapan%20MS%20(1993).%20Health%20Sector%20Review.%20Health%20Finance%20Development.%20Monograph%2C%203.&f=false)
- World Health Organisation (1995). Women and AIDS: an agenda for action. Geneva: Author.

Full Length Research Paper

The value of C-reactive protein in the diagnosis of septicaemia in children with malaria

Emmanuel Eyo Ekanem^{1*}, Ador John Uniga^{2,4}, Cosmas Akataekwe Obiora^{3,5}, Angela Ekanem Oyo-Ita⁴, Helena Martin Omang⁵

¹Department of Paediatrics, University of Calabar, Calabar, Nigeria.

²Federal Medical Centre, Jalingo, Taraba State, Nigeria.

³Federal Medical Centre, Makurdi, Benue State, Nigeria.

⁴Department of Community Health, University of Calabar, Calabar, Nigeria.

⁵Department of Medical Microbiology, University of Calabar, Calabar, Nigeria.

Received 19 October, 2017; Accepted 24 November, 2017

Malaria and septicaemia, both major causes of infant and early childhood morbidity and mortality in Nigeria, often co-exist and are difficult to differentiate. This study was designed to test the hypothesis that C-reactive protein (CRP) levels could differentiate between malaria and malaria coexisting with septicaemia. One hundred and fifty-one children aged 6 to 60 months with fever without localising signs and 141 aged/sex-matched controls were studied. C-reactive protein levels in all the children were determined while the febrile children had their blood cultures done. ANOVA and students't' test were used to determine the difference between groups. Sensitivity, negative predictive and positive predictive values for malaria coexisting unit septicaemia were calculated for various levels of CRP. One hundred and thirty (86.1%) of the subjects had malaria alone while 21 (13.9%) had malaria coexisting with septicaemia. Organisms isolated were mainly *Enterobacteriaceae* (7), *Staphylococcus aureus* (9), *Salmonella* spp. (4) and *Streptococcus pneumoniae* (1). The mean serum CRP levels in subjects with malaria alone and malaria coexisting with septicaemia were 82.16 ± 44.94 mg/l and 108.44 ± 55.65 mg/l respectively ($P=0.0176$). At the diagnostic level of 90 mg/l (value just greater than the mean for malaria alone), CRP was highly sensitive (sensitivity 76.2%) in detecting septicaemia in 21 subjects with comorbidity while specificity (36.9%) was low. It is concluded that CRP can differentiate between malaria and malaria with septicaemia. In children with malaria, antibiotics should be started at the CRP level of ≥ 90 mg/l.

Key words: Malaria, septicaemia, C-reactive protein, diagnosis.

INTRODUCTION

Malaria infection, and septicaemia defined as the presence of infection (in the blood) together with systemic

*Corresponding author. E-mail: profekanem@gmail.com. Tel: +234-8022907609.

manifestations of infection (Levy, 2003; Dellinger, 2013), are major causes of infant and early childhood morbidity and mortality in Nigeria (Adepoju et al., 2017; Akpede et al., 1993). Both often co-exist (Akpede et al., 1993; Tupchong et al., 2015). While each has different modality of treatment, clinical differentiation can be difficult. This causes delays in treatment and worsens outcome. In addition, attempt to use laboratory parameters like white blood cell count, absolute neutrophil count and erythrocyte sedimentation rate to differentiate malaria from malaria coexisting with septicaemia have not been sufficiently reliable (Rasmussen and Rasmussen, 1982; Enyuma et al., 2015). However, C-reactive protein CRP, an acute phase reactant, has been found useful in differentiating bacterial from non-bacterial infections in various circumstances (Liu et al., 2013; Sabel et al., 1974). Though malaria infection is known to stimulate CRP production, we hypothesized that malaria coexisting with septicaemia would stimulate even more CRP production. This work was designed to determine the value of C-reactive protein levels in differentiating between malaria alone and malaria with septicaemia in children.

MATERIALS AND METHODS

Consecutive studies of 292 (151 febrile subjects without localizing sign/signs and 141 age/sex matched healthy controls) children, aged 6-60 months were carried out. These were attending the Children Emergency Room (CHER) and the Child Welfare Clinic (CWC) of the University of Calabar Teaching Hospital (UCTH) Nigeria. All had their blood films (thick and thin) examined for malaria parasite after staining with Giemsa stain and read under $\times 100$ -power microscope (WHO, 1991). In addition, blood culture (not done on controls), was done and antibiotic sensitivity of isolated organisms was determined by the Disk Diffusion Method (Tendencia, 2004). Erythrocyte sedimentation rate (ESR) (Westergren method) was also done. Total white blood cell count (WBC) absolute neutrophil count (ABNC) were also done within 2 h of collection of sample by an Automated Haematology System Cell Counter (ADVIA(g) 60 Closed Tube (CT) manufactured by Bayer Cooperation, New York, United States of America. Serum CRP was estimated for both subjects and controls using High Sensitivity Enzyme Immunoassay (EIA) kit – Kalon Biological Ltd., U.K. Data were analysed in groups using EPI info version 6; 2002. ANOVA and Students t-test were used to determine the significance of the difference between three and two groups respectively. A p-value of < 0.05 was regarded as significant. Sensitivity, specificity, positive predictive value and negative predictive value for malaria coexisting with septicaemia were calculated for various levels of CRP. Ethical clearance was obtained from the Research Ethics Committee of the University of Calabar Teaching Hospital, Calabar, Nigeria.

RESULTS

One hundred and fifty one subjects were recruited. Eighty-six (57.0%) were males while 65 were females

(43.0%) giving a male to female ratio of 1.3: 1. One hundred and thirty (86.1%) subjects had malaria alone while 21 (13.9%) had malaria coexisting with septicaemia. Organisms isolated were *Staphylococcus aureus* (9), *Enterobacteriaceae* (7), *Salmonella* spp. (4) and *Streptococcus pneumoniae* (1) most of which were sensitive to gentamycin and ceftriaxone (Table 1). The mean age of those who had malaria with coexisting septicaemia was 20.28 ± 9.27 months with a range of 6 to 38 months. The means of WBC count, absolute neutrophil count, and ESR could not differentiate subjects with malaria alone from those with malaria coexisting with septicaemia (Table 2a and b). The range of CRP levels for children with malaria alone was 0.00 – 210.70 mg/L and for children with malaria and septicaemia 7.30-202.80 mg/dL. The respective means were 82.16 ± 44.94 mg/l and 108.44 ± 55.65 mg/L respectively. This difference was statistically significant at $p < 0.0176$ (Table 3). At a diagnostic level of 90 mg/l (value greater than the mean for malaria alone), CRP was highly sensitive (sensitivity=76.2%) in detecting septicaemia in 21 subjects with co-morbidity while the specificity was low (36.9%) (Table 4). Out of 141 aparasitaemic controls, 37 had serum CRP values above normal (0.2 to 6.0 mg/l).

DISCUSSION

This study has confirmed a high prevalence (13.9%) of septicaemia coexisting with malaria in young children. The main isolates were *Enterobacteriaceae*, *S. aureus* and *Salmonella* spp. Most (88.8%) of these isolates were sensitive to gentamycin and ceftriaxone. The high prevalence of septicaemia in children with malaria has been attributed to possible impairment of the capacity of monocytes that have ingested erythrocytes to phagocytose and kill bacteria that invade the blood stream. Also, the immune system of children with *Plasmodium falciparum* malaria is thought to be further impaired by a transient loss of B-cell function and reduction in T-lymphocytes (Weinstein and Swartz, 1974; Whittle et al., 1984). In addition, cytoadherence of infected erythrocytes to vascular endothelium occurs in *P. falciparum* malaria (Warrell et al., 1990). This may lead to obstruction of blood flow and capillary damage with resultant vascular leakage of protein and fluid, and oedema and tissue anoxia in the brain, heart, lungs, intestines, and kidneys. Damage to the intestinal mucosa due to tissue anoxia makes it possible for enteric organisms to escape into the blood stream (Warrell et al., 1990; John, 2016). This may explain why enteric organisms were the main isolates in this study.

The means of WBC count, absolute neutrophil count, and ESR could not differentiate subjects with malaria alone from those with malaria coexisting with septicaemia. Several factors including haemolysis

Table 1. Antimicrobial sensitivity pattern of isolates from children with septicaemia.

Sensitivity	Organisms Isolated			
	Entero (7)	Staph (9)	Salmon (4)	Strep (1)
Gentamycin	7(100.0%)	8(88.8%)	4(100.0%)	1(100.0%)
Erythromycin	-	8(88.8%)	-	1(100.0%)
Penicillin	-	0(0.0%)	-	-
Chloramphenicol	2(28.6%)	4(44.4%)	0(0.0%)	0(0.0%)
Ampicillin	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Cotrimoxazole	2(28.6%)	1(11.1%)	0(0.0%)	0(0.0%)
Streptomycin	4(57.1%)	5(55.5%)	-	-
Ceftazidime	6(85.7%)	7(77.7%)	4(100.0%)	-

Entero=*Enterobacteriaceae*; Staph=*Staphylococcus aureus*; Salmon=*Salmonella spp*; Strep=*Streptococcus pneumoniae*. Figures in parentheses represent the total number of each bacterial isolate. - = not tested

Table 2a. The means, standard deviations and ranges of WBCs, ABNCS and ESR in children with malaria alone, malaria with septicaemia and in controls.

Status	Number of Subjects	WBC/mm ³			ABNCs/mm ³			ESR/ mm in 1 st h			P-value
		Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	
Malaria	130	7.39	4.25	1.20 - 23.50	4166.83	2774.32	247.00 - 14775.00	46.31	32.18	3.0 - 145.00	0.1532
Malaria with septicaemia	21	6.72	4.37	3.20 - 19.70	3527.95	2747.82	779.00 - 1152.00	35.57	29.17	1.0 -100.00	
Control	141	7.17	2.93	0.00 - 21.00	2825.64	1917.21	430.00 -16758.00	18.82	19.65	0.00 - 130.00	

Table 2b. Comparison of all groups using T-stat.

Status	Number of subjects	Comparison	WBC	ABNC	ESR	CRP
Malaria(a)	130	a versus b	*1.9021 (0.4082)	0.9804(0.3285)	1.435 (0.1532)	2.4015 (0.0176)
Malaria with Septicaemia(b)	21	b versus c	*3.2106 (0.3013)	1.4700 (0.1436)	3.395 (0.0009)	20.710 (0.0000)
Controls(c)	141	a versus c	*0.3398 (0.7062)	4.6400 (0.0000)	8.555 (0.0000)	19.85 (0.0000)

*=T-stat. Figures in parenthesis are p-values. WBC = White blood count; ABNC =Absolute neutrophil count; CSR = Erythrocyte sedimentation rate; CRP = C- reactive protein.

Table 3. Mean CRP levels and p-values in subjects with malaria, malaria with bacteraemia, and in controls.

Status	Number of subjects	CRP mg/l			Comparison	T-stat	p-value
		Mean	SD	Range			
Malaria (a)	130	82.16	44.94	0.00 – 210.70	a versus b	2.40	0.02
Malaria with septicaemia (b)	21	108.44	55.65	7.30 – 202.50	b versus c	20.710	0.00
Controls (c)	141	5.58	8.52	0.00 – 38.00	a versus c	19.85	0.00

Comparison of all groups:F-stat= 209.32; p-value=0.00.

Table 4. sensitivity, specificity, and positive and negative predictive values of CRP 40 to 100 mg/L in subjects with malaria coexisting with septicaemia.

CRP (MG/L)	Sensitivity	Specificity	Positive predictive values	Negative predictive values
50	81.0	27.6	15.3	90.0
60	81.0	30.0	15.7	90.6
70	81.0	33.1	16.3	91.5
80	76.2	36.9	16.3	90.5
90	76.2	36.9	16.3	90.5
100	38.1	83.1	27.0	89.2

(common in malaria), endogenous steroid, and catecholamines lead to increase in WBC and absolute neutrophil count, while female sex, anaemia, dilutional problem, increased temperature of specimen especially in the tropics, and a tilted measuring tube lead to increase in ESR. These factors might come into play during acute illnesses thereby rendering WBC, absolute neutrophil count, and ESR less appropriate for use in the detection of septicaemia in children with malaria (Philips et al., 1986; McLellan and Giebink 1986; Bouree et al., 2000; Enyuma et al., 2015).

While malaria alone stimulated CRP production in this study, those with malaria coexisting with septicaemia had higher mean serum CRP levels (108.44 mg/l) than those with malaria alone (82.16 mg/l). This difference was highly significant ($p < 0.0176$). Whether this high mean level in subjects with co-morbidity was as a result of a synergistic or summation effect is unclear. It is probable that their combined activation of mononuclear cells resulted in the production of higher levels of inflammatory cytokines (tumour necrosis factor, interleukins 1, 2 and 6) that stimulated hepatic synthesis of higher inflammatory proteins including CRP (Bouree et al., 2000). It has been observed that patients with bacterial infections tend to have higher peaks of CRP than those with other conditions (Landry et al., 2017). Thus, serum CRP could distinguish between malaria and malaria co-existing with septicaemia. When this was done at CRP value of 90 mg/l, it gave a sufficiently high sensitivity of 76.2% and a negative predictive value (NPV) of 90.5% but a low specificity of 36.9% and positive predictive value (PPV) of

16.3%. Despite the low specificity and low positive predictive value, CRP has several advantages over ESR, WBC, and absolute neutrophil count. It is known to rise 6-12 h after onset of illness (Kohli et al., 1993) and not affected by immunological status of the child, age, sex, or anaemia (Black et al., 2004). It returns to normal within a week of successful treatment while it takes three to six weeks for ESR to do so (McLellan and Giebink, 1986; Kohli et al., 1993). It is cost effective and is adapted for easy technique of measurement (Kohli et al., 1993). In India, Chhatriwala et al. (2014) demonstrated the prognostic value of CRP in children with malaria, though they did not explore the role of septicaemia in this response.

Septicaemia is rapidly fatal in young children if not treated promptly. Therefore, it is recommended that at CRP levels of ≥ 90 mg/l antibiotics should be started. We recommend in our environment that gentamycin and ceftriaxone be used. These can be withdrawn if preliminary blood culture result is negative.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

We are grateful to nurses and staff of the Children Emergency Room and Child Welfare Clinic who

participated in the management of these children. Finally, we thank the Medical Laboratory Scientists for their assistance in the conduct of the various tests.

REFERENCES

- Adepoju KA, Akpan GE (2017). Historical assessment of malaria hazard and mortality in Nigeria – cases and deaths: 1955-2015. *Int. J. Environ. Bioener.* 12(1):30-46.
- Akpede GO, Abiodun PO, Sykes MR (1993). Malaria with bacteraemia in acutely febrile pre- school children without localising signs: Coincidence or association/complications. *J. Trop. Med. Hyg.* 3:146-50.
- Bouree P, Botterel F, Lancon A (2000). Comparative study of ESR and CRP in acute malaria. Available at: <https://www.scribd.com/document/64307943/An-02>
- Chhatriwala M, Patel B, Shah R, Shaikh N, Gokani R, Nilawar A (2014). Prognostic value of serum C - reactive protein in malaria IJBAR. (10):513-515.
- Enyuma COA, Ekanem EE, Udo JJ, Asindi AA (2015). Haematological indices in febrile neonates with malaria in parasitaemia in Calabar. *Niger. Med. J.* (5):323-326.
- John CC (2016). Malaria (Plasmodium). In: Behrman R E, Kliegman R M, Jenson H B (2000). eds. *Nelson Textbook of Paediatrics*. 20th ed. Philadelphia: W B Saunders Company (Publishers). pp. 1709-1721.
- Kohli V, Singhi S, Sharma P, Ganguly, KN (1993). Value of serum C-reactive protein concentrations in febrile children without apparent focus. *Ann. Trop. Pediatr.* (4):373-378.
- Landry A, Doherty P, Qullette S, Carter LJ. (2017). Causes and outcomes of markedly elevated C-reactive protein levels. *Can. Fam. Phys.* 63(6):e316-e323.
- Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, Cook D, Cohen J, Opal SM, Vincent JL, Ramsay G (2003). 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definition Conference. *Crit. Care Med.* 29(4):530-538.
- Liu S, Ren J, Wu X, Ren H, Yan D, Wang G, Gu G, Li J, Xia Q, Han G (2013). Preliminary case-control study to evaluate diagnostic values of C-reactive protein and erythrocyte sedimentation rate in differentiating active Crohn's disease from intestinal lymphoma, intestinal tuberculosis Behcet's syndrome. *Am. J. Med. Sci.* 346(6):467-472.
- McLellan D, Giebink GS (1986). Perspectives on occult bacteraemia in children. *J. Pediatr.* 109(1):1-8.
- Phillips RE, Looareesuwan S, Warrell DA, Lee SH, Karbwang J, Warrell MJ, White NJ, Swasdichai C, Weatherall DJ(1986). The importance of anaemia in cerebral and uncomplicated falciparum malaria: role of complications, dyserythropoiesis and iron sequestration. *QJM: An Int. J. Med.* 58(3-4):305-323.
- Rasmussen NH, Rasmussen NL (1982). Predictive value of white bloodcell count and differential cell count to bacterial infections in children. *Acta Pediatr.* 5:775-778.
- Sabel KC, Hanson LA (1974). The clinical usefulness of C-reactive protein (CRP) determinations in bacterial meningitis and septicaemia in infancy. *Acta Paediatr.* 3:381-388.
- Tendencia EA (2004). Disk Diffusion In: *Laboratory Manual of Standardized Methods for antimicrobial tests for bacteria isolated from aquatic animals and environment*. Tigbavan, Ibilio; Aquaculture Dept, Southeast Asian Fisheries Development Centre. pp.13-29.
- Tupchong K, Koyfman A, Foran M. (2015). Sepsis, severe sepsis, and septic shock: A review of the literature. *Afr. J. Emergency Med.* 5(3):127-135.
- Warrell DA, Molyneux ME, Beales PF (1990). Severe and complicated malaria: march 1988. *Trans. Royal Soc. Trop. Med. Hyg.* P 8.
- Weinstein L, Swartz MN (1974). Pathophysiologic changes due to localization of Infections in Specific Organs. In: Weinstein L, Swartz MN, eds. *Pathophysiologic (physiology) Mechanism of Diseases*. 5th edn. Philadelphia: W.B Saunders (Publishers). pp. 389-510.
- Whittle HC, Brown J, Marsh K, Greenwood BM, Seidelin P, Tighe H, Wedderburn L (1984). T-cell control of Epstein–Barr virus-infected B cells is lost during *P. falciparum* malaria. *Nature* 312(5993):449-450.
- World Health Organization (WHO) (1991). *Basic malaria microscopy*. World Health Organization. pp. 19-20.

Full Length Research Paper

Descriptive analysis of neoplasias diagnosed as pleomorphic adenoma (PA) that presented at the University of Nigeria Teaching Hospital Ituku-Ozalla Enugu

James Onuorah Akpeh¹, Uchenna Chukwuemeka Okechi^{2*}, Kenneth Amaechi Agu³ and Basil Chukwuemeka Ezeanolue¹

¹Department of Otorhinolaryngology, Faculty of Medical Sciences, College of Medicine, University of Nigeria, Ituku-Ozalla, Enugu, Nigeria.

²Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, College of Medicine, University of Nigeria, Ituku-Ozalla, Enugu, Nigeria.

³Department of Surgery, Faculty of Medical Sciences, College of Medicine, University of Nigeria, Ituku-Ozalla, Enugu, Nigeria.

Received 29 November, 2017; Accepted 2 January, 2018

Pleomorphic adenoma of the salivary gland is described as a slow growing painless benign tumor characterized histologically by its mixed appearance with epithelial and myoepithelial components. It occurs in both the major and minor salivary glands with the parotid gland as the commonest site for the major gland while the palate is the commonest site for the minor glands. This study was conducted to evaluate the clinical presentation of pleomorphic adenoma seen in the University of Nigeria Teaching Hospital Ituku/Ozalla, Enugu, Nigeria. Records of all the patients with pleomorphic adenoma seen in the clinics within a six year period (January 2009 to December 2014) were retrospectively reviewed. Relevant information retrieved from the patients' file. Data was analyzed using SPSS version 23; qualitative variables were compared using chi-square test. A total of 37 cases (prevalence = 41.1%) of pleomorphic adenoma of the major and minor salivary gland met the required criteria for inclusion in the study. Majority of the cases occurred in females. The mean age of the patients was 38.2 and standard deviation was 16.4. The mean duration of the tumor at presentation was 39.4 months. Parotid gland was the commonest site. Postoperative complication seen was facial nerve palsy. Most of the tumors occurred on the left side. Pleomorphic adenoma present as a painless swelling is seen more in our environment among women. The peak age of occurrence is in the 4th decade of life. Surgical excision is the mainstay of treatment. Many of the patients presented years after the onset of tumor growth.

Key words: Pleomorphic adenoma, salivary gland, benign tumors.

INTRODUCTION

Salivary gland tumors are rare when compared with other tumors in the head and neck regions and studies have

shown that they make up about 3 to 6% of the head and neck tumors (Everson and Cawson, 1985; Araya et al.,

2015). Majority of them are benign tumors and occurs mostly in the major salivary glands with the parotid gland being the most affected gland while the submandibular and sublingual glands are less affected (Rai et al., 2011; Patil et al., 2014). Eneroth (1971) reported that 80% of pleomorphic adenoma of the parotid gland, are found within the superficial lobe. Within the mouth, the palate constitutes the commonest site (60%) of the minor salivary glands tumors while other sites less affected are the lips, tongue and buccal mucosa, also about 80 to 90% of benign salivary gland tumors are pleomorphic adenoma (Rai et al., 2011). Most studies favors female predilection (Everson and Cawson, 1985; Ito et al., 2009; Araya et al., 2015).

Pleomorphic adenoma, also known as mixed tumor, presents as a slow growing, painless, non-tender swelling. World Health Organization (WHO) described it as a well-defined tumor characterized by its mixed appearance and basically an epithelial tumor with complex structural organization having epithelial and myoepithelial components in either a mucoid, myxoid, chondroid or osteoid connective tissue arranged in different patterns (Eveson et al., 2005; Rousseau and Badoual, 2011). Treatment of this tumor includes surgical excision with safe margin but other options have been reported (Nzegwu et al., 2011; AL-Khtoum et al., 2013; Elumelu et al., 2014).

Studies on salivary gland tumors have been reported in Enugu, south eastern part of Nigeria but none was focused on pleomorphic adenoma histopathological variant (Ezeanolue, 1999; Nzegwu et al., 2011).

Objective

The objective of this study was to evaluate the clinical presentation of pleomorphic adenoma seen in the Otorhinolaryngology and Oral and Maxillofacial Surgery services of University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu.

MATERIALS AND METHODS

This is a six-year retrospective study of all patients with pleomorphic adenoma of the salivary glands seen at the Oral and Maxillofacial Surgery and the Otorhinolaryngology Departments of the University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu from January 2009 to December 2014. Records of all the patients with salivary gland lesions were sorted and their case files retrieved from the health record department. Relevant demographics, clinical, histopathological and treatment information were obtained from the patients' record. Those included in this study were all patients with complete data who presented to these clinics within the study

period and have histological confirmation of the excised surgical specimen as pleomorphic adenoma. Other histopathological variants and cystic swellings were excluded. Those cases without their histopathology report seen and those with incomplete records were excluded from the study.

Data computation and analysis

Data were computed and analyzed using Statistical Package for Social Sciences (SPSS) version 23, Chi-square test was used to compare qualitative variables, p-value of 0.05 or less was considered as significant.

Ethical clearance

Ethical approval was obtained from the Health Research Ethics Committee of the University of Nigeria Teaching Hospital.

The study was limited by poor record keeping, improper documentation and patients' loss to follow-up as many cases were excluded due to these reasons.

RESULTS

In the period under study, 90 patients were treated for salivary gland lesions. Only 37 (41.1%) of them met the inclusion criteria. Fifty three were excluded because of the following reasons: incomplete data, missing histopathological report and other pathological types such as adenocystic carcinoma, mucoepidermoid carcinoma, canaliculi cell adenoma, cystic lesions and those that declined surgery. The 37 eligible cases were further analyzed and reported herein. Sex distribution showed that 11 (29.7%) male and 26 (70.3%) female made up the study group. The various occupations of the subjects are as shown in Figure 1 with traders constituting the greatest majority.

The patients' mean age at presentation was 38.2 years and standard deviation (SD) of 16.35 (range 10 to 73 years), while the mean duration of the tumor at presentation was 39.43 months (range 4 to 156 months). Male subjects (48 (SD 18.3) years) were significantly older than the females (34.1 (SD 13.8) years); $p = 0.016$. Similarly, disease duration was longer in males but insignificant (56.4 (SD 43.8) Months versus 32.3 (SD 31.6) Months; $p = 0.068$).

Most of the tumors involved the parotid gland, while the anterior two third of the tongue was the site in one subject (Table 1).

Tumors in the parotid gland was most common in women (15; 57.7%) than in men 7 (63.6%). Three (30%) of the tumor in the palate were in males, while 7 (70%) were in females. Three of the four tumors in the submandibular gland occurred in females.

*Corresponding author. E-mail: uchenna.okechi@unn.edu.ng. Tel: +2348933845209.

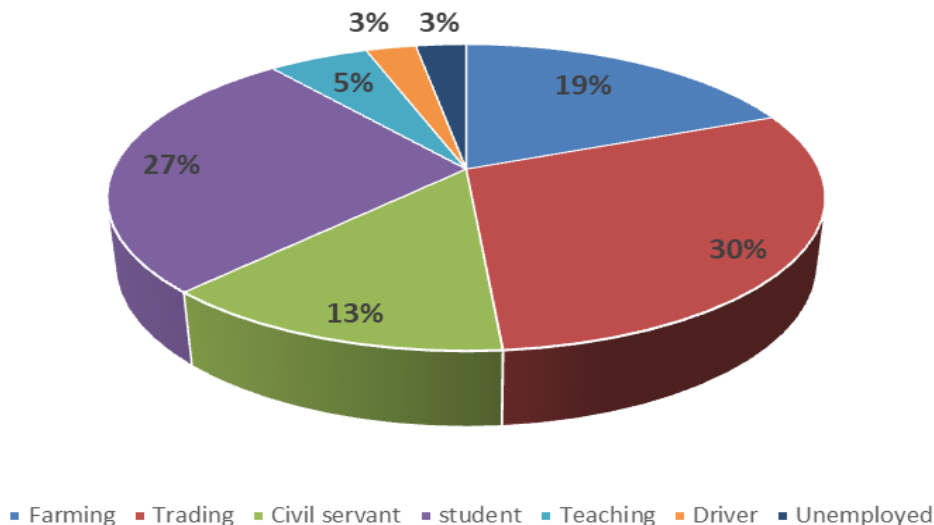


Figure 1. Occupational distribution of the subjects.

Table 1. Distribution of pleomorphic adenoma of salivary glands according to sex.

Anatomical site	Sex		Total (%)
	Male (%)	Female (%)	
Parotid	7 (19.0)	15(40.5)	22 (59.5)
Submandibular gland	1 (2.7)	3(8.1)	4 (10.8)
Palate	3 (8.1)	7(19.0)	10 (27.1)
Tongue	-	1(2.7)	1 (2.7)
Total	11(29.7)	26(70.3)	37 (100)

Chi sq = 0.512 (df=3). P=0.916. Comparing proportions. The table shows that pleomorphic adenoma occurred more than twice in female than in male and the parotid gland is the most common site of occurrence.

Table 2. Relationship between the gender of patients and the side affected.

Parameter		Affected side			Total (%)
		Right (%)	Left (%)	Central (%)	
Sex	Male	4 (10.8)	5 (13.5)	2 (5.4)	11 (29.7)
	Female	10 (27.0)	16 (43.2)	0	26 (70.3)
Total		14 (37.8)	21 (56.8)	2 (5.4)	37 (100)

Test statistic = 5.229, p-value = 0.073. The Table shows that most of the tumor occurred on the left side of the orofacial region".

Most of the tumor seen occurred on the left side of the face (Table 2).

The treatment of choice in this study was surgical excision. Nineteen (86.4%) cases affecting the parotid gland had superficial parotidectomy, while 3 (13.6%) total parotidectomy. Four (100%) of the submandibular gland tumor were all treated by gland excision.

Three patients (8.1%) had postoperative facial nerve palsy as the postoperative complications after their

parotid gland surgery.

DISCUSSION

Pleomorphic adenoma is a common benign salivary gland tumor that shows different cell morphology and arrangements. Etiology of pleomorphic adenoma is not clear but studies have suggested that exposure to

radiation and Simian virus (S40) may be implicated in causing its development (Jain et al., 2015).

Report on prevalence of pleomorphic adenoma varies. Ninety cases of salivary gland lesions were seen within the 6 years study period with pleomorphic adenoma accounting for 37 (41.1%) of them. This finding is similar to a study reported in Maiduguri, Nigeria where prevalence of 44.3% was reported (Otoh et al., 2005; Nzegwu et al., 2011). Published report on pleomorphic adenoma among Jordanians shows a prevalence of 48.8% which is also similar to the finding of the present study (AL-Khtoum et al., 2013). However, some other studies reported higher prevalence which could be attributed to the longer study period of those authors (Jude and Olu-Eddo, 2014).

The sex distribution of pleomorphic adenoma in this study shows lower male prevalence than female in a ratio of 1:2.4 which is different from previously reported studies in Enugu, Maiduguri and Lagos Nigeria where distribution ratios of 1.4:1, 2:1 and 8:7, respectively were reported (Odukoya, 1990; Otoh et al., 2005; Nzegwu et al., 2011), but is similar to some other African and Western studies which demonstrated higher frequencies in females than in males (Chizonga et al., 1995; Califano and Eisele, 1999; Eisele and Johns, 2001; Araya et al., 2015). The reasons for this finding may be attributed to laissez faire attitude of men towards their health care in Africa since pleomorphic adenoma is almost asymptomatic except for the observed swelling. On the other hand women seem to be more concerned about their facial appearance than men hence tends to seek for treatment earlier.

A mean age of 38.2 years was found in this study. This is similar to other studies reported in Enugu (35 years), Benin (37.1), Maiduguri (30.4 years) and Lagos Nigeria (31 years) as they are all within the same decade (Odukoya, 1990; Otoh et al., 2005; Nzegwu et al., 2011; Jude and Olu-Eddo, 2014). It is also comparable to some other studies in African and Middle East but appears significantly lower in some European studies (Everson and Cawson, 1985; Chizonga et al., 1995; AL-Khtoum et al., 2013). This demonstrates that pleomorphic adenoma occurs mostly within the fourth decade of life in our environment. Men were found to be significantly older than women in this study. This may be due to sudden realization of potentials of malignant transformation of the tumor in addition to the earlier stated reasons.

From this study, the mean duration of the tumor at presentation was 39.4 months (range 4 to 156 months) which is much higher than that of a Jordanian study with a mean duration of 18±7 months. This finding may be due to the slow growth rate of the tumor and its apparent symptomless presentation, hence, not perceived as life-threatening. Also, failure of the health care delivery system and out of pocket rather than insurance driven payment system may have contributed in making many of the patients to delay presenting.

Parotid gland and the palate were the most common sites of the tumor. This finding concurs with similar previous studies which reported high frequencies in the parotid gland as compared to other glands (Everson and Cawson, 1985; Otoh et al., 2005; Nzegwu et al., 2011; Patil et al., 2014). Palate is the most common site for tumors involving the minor salivary glands (Nzegwu et al., 2011; Sahoo et al., 2013; Jain et al., 2015). In contrast, Odukoya (1990) reported higher frequency of pleomorphic adenoma (68.9%) in the minor salivary glands as against 21.1% in the major glands. This study also shows that the tumor occurs rarely in the tongue, sublingual and submandibular glands (Rai et al., 2011; Nzegwu et al., 2011; AL-Khtoum et al., 2013; Patil et al., 2014). The left side is the most common side affected by this tumor in the present study. The reason for this is unknown.

In this study, gland excision was the commonest treatment option carried out for those tumors affecting the parotid and mandibular glands. For those that occur in the parotid gland, majority (86.4%) had superficial parotidectomy with preservation of facial nerve when possible due to the location of the tumor at the superficial lobe while others had total parotidectomy.

Excision of the tumor with safe margin was performed for the minor glands. The rationale for this was to completely remove the tumor and satellites thereby preventing micro extensions which may lead to recurrence. Other treatment options like enucleation and radiotherapy were not utilized even though reported in other studies (AL-Khtoum et al., 2013; Elumelu et al., 2014).

Treatment outcome in this study was good as no case of recurrence has been recorded within the study period. Facial nerve injury was the most common complication seen after surgical excision of the parotid gland and this occurred only in 3 patients.

No case of malignant transformation was seen in our study, however, previous researches have shown that long standing pleomorphic adenoma may transform to malignant tumor (carcinoma ex pleomorphic adenoma) in any of the affected gland and this risk is also believed to increase in recurrent cases (Freeman et al., 2003; To et al., 2003; Rowley et al., 2006; Jain et al., 2015).

Conclusion

Pleomorphic adenoma is a relatively common salivary gland tumor in our environment. It occurred more in females than males in this study which appear similar to many other studies. The age distribution, treatment option and the site of occurrence are also similar to other previously reported studies but most men present at an older age than the women in this study. However, majority of the patients present long after the onset of this tumor which may be due to its slow growing, painless

nature and patients' attitude towards their health condition.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- AL-Khtoum N, Qubilat AR, Al-Zaidaneen, Al-Sarhan M, AL-Qudah A (2013). Clinical characteristics of pleomorphic adenoma of salivary glands among Jordanian patients. *J. Pak. Med. Assoc.* 63(3):358-360.
- Araya J, Martinez R, Niklander S, Marshall M, Esguep A (2015). Incidence and prevalence of salivary gland tumors in Valparaiso, Chile. *Med. Oral Patol. Oral Cir. Buccal.* 20(5):e532.
- Califano J, Eisele DW (1999). Benign salivary gland neoplasms. *Otolaryngol. Clin. North America* 32(5):861-873.
- Chizonga MM, Lopez Perez VM, Portilla Alvarez AL (1995). Pleomorphic adenoma of the salivary glands. *Clinicopathological studies of 206 cases in Zimbabwe. Oral Surgery, Oral Medicine, Oral Pathol. Oral Radiol. Endodontol.* 79(6):747-749.
- Eisele DW, Johns ME (2001). Salivary gland neoplasm in Head and Neck surgery. *Otolaryngology*, Ed, BJ Bailey. Philadelphia, Lippincott Williams and Wilkins. pp. 1279-1297.
- Elumelu TN, Folasire AM, Ntekim AI Oboh O (2014). Salivary gland tumors in Nigeria patients - a 10 year review. *J. Cancer Biol. Res.* 2(3):1054-1059.
- Eneroth CM (1971). Salivary gland tumors in the parotid gland, submandibular gland and the palate region. *Cancer* 27:1415-1418.
- Everson JW, Cawson RA (1985). Salivary gland tumor. A review of 2410 cases with particular reference to histologic type, age and sex distribution. *J. Pathol.* pp. 14651-14658.
- Everson JW, Auclair PL, Gneep DR, El-Naggar AK (2005). Tumours of the salivary glands. In: Barnes L, Eveson JW, Reichart P, Sidransky D, editors. *World Health Organization Classification of Tumours: Pathology and genetics of head and neck tumours*. Lyon: IARC. pp. 209-281.
- Ezeanolue BC (1999). Salivary gland neoplasms: a descriptive analysis of the pattern seen in Enugu. *West Afr. J. Med.* pp. 179-182.
- Freeman SR, Sloan P, de Carpentier J (2003). Carcinoma ex Pleomorphic adenoma of the nasal septum with adenoïd cystic and squamous carcinomatous differentiation. *Rhinology* 41:118-121.
- Ito FA, Jorge J, Vargas PA, Lopes MA (2009). Histopathological findings of pleomorphic adenomas of the salivary glands. *Med. Oral Patol. Oral Cir. Bucal.* 14:57-61.
- Jain S, Hasan S, Vyas N, Shah N, Dalal S (2015). Pleomorphic adenoma of the parotid gland: report of a case with review of literature. *Ethiop. J. Health Sci.* 25(2):189-194.
- Jude UO, Olu-Eddo AN (2014). Salivary gland tumors, a twenty year retrospective study. *Afr. J. Med. Health Sci.* 13(10):24-29.
- Nzegwu MA, Njeze NR, Ugochukwu AI, Amu C, Okolugbe N, Okoye L.O., Mba AU, Uguru CC (2011). A review of salivary gland neoplasms in Eastern Nigeria for A five-year period from January 1, 2000 to December 31st 2004. *Adv. Biores.* 2(1):28-32.
- Odukoya O (1990). Pleomorphic Adenoma of the salivary glands in Lagos, Nigeria. *Clinicopathological analysis of 45 cases. Central Afr. J. Med.* 36(10):251-256.
- Otoh EC, Johnson NW, Olasoji H, Danfilo IS, Adeleke OA (2005). Salivary gland neoplasms in Maiduguri, north-eastern Nigeria. *Oral Dis.* 11(6):386-391.
- Patil P, Burde K, Naikmasur VG, Thorawat A (2014). Pleomorphic adenoma of submandibular gland: A case report with review of literature. *Dental Res. J.* 11(3):411-414.
- Rai S, Sodhi SPS, Sandhus SV (2011). Pleomorphic adenoma of submandibular gland: An uncommon occurrence *Natl J Maxillofac Surg.* 2(1):66-68.
- Rousseau A, Badoual, C (2011). Head, neck: Salivary gland tumors: an overview *Atlas Genet. Cytogenet. Oncol. Haematol.* 15(6):533-541.
- Rowley H, Murphy M, Smyth D, O'Dwyer TP (2006). Recurrent pleomorphic adenoma: Uninodular versus multinodular disease. *Irish J. Med. Sci.* 169(3):201-203.
- Sahoo NK, Rangan MN, Gadad RD (2013). Pleomorphic adenoma palate: Major tumor in a minor gland. *Ann Maxillofac. Surg.* 3(2):195-197.
- To EW, Tsang WM, TSe GM (2003). Mucoepidermoid carcinoma ex pleomorphic adenoma of the submandibular gland. *Am. J. Otolaryngol.* 64:253-257.



International Journal of Medicine and Medical Sciences

Related Journals Published by Academic Journals

- *Journal of Medicinal Plant Research*
- *African Journal of Pharmacy and Pharmacology*
- *Journal of Dentistry and Oral Hygiene*
- *International Journal of Nursing and Midwifery*
- *Journal of Parasitology and Vector Biology*
- *Journal of Pharmacognosy and Phytotherapy*
- *Journal of Toxicology and Environmental Health Sciences*

academicJournals