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Original Article

A study on the Electrolytes Imbalance in Leprosy Patients in a Tertiary Care Center

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Abstract
Objective: *To evaluate the electrolyte imbalance in leprosy patients.*
Methods: *This was a case-control study. The present study was conducted in a tertiary care hospital. A total of 30 leprosy patients of either gender and 30 controls were included in the study. Blood samples were collected and the serum was separated within 30–45 min, aliquoted and stored at 20^{C} for further analysis. Serum analysis for Na+, and K+, Ca++ and Cl^- was performed by the standard methods.*
Results: *More than one third of cases (40%) and 26.7% of controls were <40 years of age. More than half of cases (60%) and 50% of controls were males. There was no significant ($p>0.05$) difference in age and gender between cases and controls showing comparability of the groups in terms of age and gender. The serum electrolytes levels sodium and potassium showed decreased level among cases compared to controls ($p<0.05$). However, calcium and Cl^- increased among the cases than controls ($p<0.01$).*
Conclusion: *It was concluded that differences in electrolytes found in leprosy may have a great potential as a diagnostic tool in clinical practice. Electrolyte imbalance has a significant effect upon the risk of contracting many diseases.*
Keywords: *Leprosy, Electrolyte imbalance, Diagnostic tool.*

Introduction

Although in January 2006 leprosy was eliminated in India but it is still a public health problem in the country (Announcement: India achieves national elimination of leprosy, 2006). In India, a total of 0.92 lac cases were on record as on April 2013, giving a Prevalence rate (PR) of 0.73 per 10,000 population and in Rajasthan 0.12 lac cases were on record as on April 2013, giving a prevalence rate of 0.18 per 10,000 population (NLEP , 2013). Leprosy is one of the leading causes of physical disabilities contributing to intense social stigma resulting in human discrimination. This chronic infectious disease caused by Mycobacterium Leprae principally affects skin and peripheral nerves; it also involves muscles, eyes, bones,

testis and internal organs. The clinical manifestations are varied ranging from an insignificant skin lesion to extensive disease causing profound disability/deformities (Suri et al, 2014).

Leprosy is caused by Mycobacterium leprae bacillus, that affects mainly peripheral nerves and skin but may also affect other sites such as the eyes, mucous membranes, bones, and testes and produces a spectrum of clinical types (Walker and Lockwood, 2007; Graham et al, 2010; Polycarpou et al, 2013). The presence of bacilli in the skin produces the dermatological manifestations of the disease, and nerve infection produces axonal dysfunction and demyelination, leading to sensory loss and its consequences of disability and deformity (Graham et al, 2010; Thakkar et al, 2014). The term Leprosy is a tribute to the Norwegian physician Gerhard Armauer Hansen, who identified the bacillus Mycobacterium leprae as the cause of the disease in 1873 (Eidt, 2004). In 1966, Ridley–Jopling classified leprosy according to clinical, bacteriological, immunological, and histological criteria into TT (Tuberculoid Tuberculoid), BT (Borderline Tuberculoid), BB (Borderline Borderline), BL (Borderline Lepromatous), and LL (Lepromatous Lepromatous) (Ridley and Jopling, 1966). In 1982, WHO proposed simplified classification of pauci and multibacillary leprosy based on clinical findings and the bacteriological index to facilitate diagnosis and treatment of leprosy in the field (Gaschignard et al, 2016). However, Ridley-Jopling classification is widely accepted by pathologists and leprologist. Clinical diagnosis in some cases can be difficult which can lead to occurrence of resistant cases if treated inadequately. Skin biopsies play an important role in diagnosing and classifying different types of leprosy (Thakkar et al, 2014).

Electrolytes are present in the human body. Electrolytes play an important role in many body processes, such as controlling fluid levels, acid-base balance (pH), nerve conduction, blood clotting and muscle contraction. Potassium, sodium, calcium and chlorine are the important for proper electrolyte balance. Electrolyte imbalance resulting from kidney failure, dehydration, fever, and vomiting has been suggested as one of the contributing factors toward complications observed in diabetes and other endocrine disorders.

The objective of this study was to evaluate the electrolyte imbalance in leprosy patients.

Material and Methods

This was a case-control study. The present study was conducted in a tertiary care hospital. A total of 30 leprosy patients of either gender and 30 controls were included in the study.

The objective of the study was well explained to all participants in this study. The anonymity of patients was maintained by coding the sample. Permission for this study was obtained from the college ethical committee. Blood samples were collected and the serum was separated within 30–45 min, aliquoted and stored at 20^{C} for further analysis. Serum analysis for Na+, and K+, Ca++ and $Cl^-$was performed by the standard methods.

Statistical analysis

Statistical analyzes were done using the Statistical Package for the Social Sciences (SPSS for windows, version 20.0; SPSS Inc., Chicago, IL, USA). Data were presented using Mean±SD for all quantitative values. Statistical significance was determined as a p value < 0.05 were considered statistically highly.

Results

More than one third of cases (40%) and 26.7% of controls were <40 years of age. More than half of cases (60%) and 50% of controls were males. There was no significant ($p>0.05$) difference in age and gender between cases and controls showing comparability of the groups in terms of age and gender (Table-1).

The serum electrolytes levels sodium and potassium showed decreased level among cases compared to controls ($p<0.05$). However, calcium and Cl^-increased among the cases than controls ($p<0.01$) (Table-2).

Table-1: Demographic profile of cases and controls

Demographic profile	Cases (n=30)		Controls (n=30)		p-value[1]
	No.	%	No.	%	
Age in years					
<40	12	40.0	8	26.7	0.27
≥40	18	60.0	22	73.3	
Gender					
Male	18	60.0	15	50.0	0.43
Female	12	40.0	15	50.0	

[1]Chi-square test

Table-2: Comparison of serum electrolytes between cases and controls

Electrolytes	Cases (n=30)	Controls (n=30)	p-value[1]
Sodium in Mmol/L	135.49±4.15	139.72±5.44	0.001*
Potassium in Mmol/L	3.78±0.75	4.36±0.92	0.01*
Calcium in Mmol/L	2.35±0.69	1.75±0.64	0.001*
Cl^- (mmol/L)	112.84±6.37	107.51±3.88	0.0001*

[1]Unpaired t-test, *Significant

Discussion

Leprosy is believed to have been introduced in Europe from India by the troops of Alexander, the Great, 300 BC. Its incidence was high in Europe and the Middle East during the Middle Ages. The number of cases was dramatically reduced around 1870 because of the socioeconomic development. Leprosy is assumed to have been introduced in Latin America during the colonization period by French people in the United States and by Spanish and Portuguese people in South America. African slave traffic was the major cause of the spread of leprosy in the Americas. The first cases were reported in Brazil in 1600 in the city of Rio de Janeiro. The first isolation hospital was installed in Rio de Janeiro. After that, the disease spread to the other Brazilian regions (Eidt, 2004).

Our body needs electrolytes; when these substances are present in sufficient quantities body functions normally. During electrolyte imbalance normal cellular functions are impaired. The degree of impairment, the symptoms and the severity of this depends on the degree that body has exceeded the normal limits. Electrolytes have several functions. They are used to conduct electricity, the central nervous system sends electrical impulses throughout the body, they can act as secondary messengers, skeletal muscle fibers will respond to a larger than normal electrical stimulus and electrolytes can serve also as catalysts for enzymatic reactions (Rajat, 2008).

Biochemical investigation in leprosy has not been carried out as extensively as in other infectious diseases, and it is only within the last twenty years that any important chemical studies have been made. The nutritional problem in leprosy has but recently received the attention of biochemists, though it is of interest to associate chemical tests with clinical examinations in order to obtain a more exact understanding of the evolution and prognosis of the disease.

The present study showed decreased level of sodium and potassium among the leprosy cases than controls. However, increased level of calcium and $Cl^-$was found. In a study (Lundin and Ross, 1958), serum calcium was below normal in lepromatous cases. Potassium was below normal in lepromatous cases. Sodium was slightly decreased in the lepromatous cases. These abnormalities occurred chiefly in the active lepromatous cases. Asymptomatic hyponatremia was encountered in chronic debilitating diseases, and this might account for the slightly lower levels. The serum calcium was analyzed for its diffusible fraction by Wooley and Ross (106), who found a considerably lower average in lepers than in normal young men (53 lepers and 15 controls).

The complex lepromatous processes occurring inside various organs may effect the serum trace elements, which play a vital role in metabolism and also act as catalysis in biochemical reactions of the body leading to deterioration of trace element supplies (Van et al, 1981).

Conclusion

It was concluded that differences in electrolytes found in leprosy may have a greatpotential as a diagnostic tool in clinical practice. Electrolyte imbalance has a significant effect uponthe risk of contracting many diseases.

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