

Original Article

Seasonal Variation of Appendicitis in High Altitude Region of Nepal: Five years' Experience of a Teaching HospitalSuryaman Menyangbo¹, Gakul Bhatta¹, Harihar Devkota¹, Manik Neupane¹, Poojan Rokaya¹, Prem Prasad Panta²¹Assistant professor, ²Associate professor, Karnali academy of health sciences, Jumla Nepal**Corresponding author:**

Dr. Suryaman Menyangbo; Head of Department of General surgery,

Email: suryaman77@gmail.com**ABSTRACT**

Background: Acute appendicitis is the most common general surgical disease, worldwide. The exact etiology is still in conjecture. However, the inadequate fiber in diet, smoking, mechanical obstruction in appendiceal lumen, has been attributed as factors for appendicitis. Appendicitis presents throughout months of the year, however, incidence increases in particular months. The objective of this study is to observe the appendicitis incidence variation with months of the year in high altitude region of Nepal.

Methods: The cross-sectional retrospective study was conducted in the Karnali Academy of Health Sciences, Jumla situated at the altitude above 2500 m from sea level. The clinical data were retrieved from the hospital record book in the Operation Theater that included age, gender, ethnicity, month of the appendectomy executed, pre-operative clinical presentation, and operative findings. The period of study was from July 2014 to March 2020. The data were entered in Microsoft Excel software and descriptive analysis was done to get mean, median percentage, standard deviation by SPSS 16.

Results: A total of 119 appendectomies performed during 5 years period, from 2014 to 2020, in the surgery department of Karnali Academy of Health Sciences were recorded. The mean age of appendectomy was 27 years. There were 53% female (n=64) and 46% male (n=55) patients. The months in which the highest appendectomy executed were July/August/September and February with 16% (n=19), 13.4% (n=16), (n=15) 12.6% and 13.4% (n=16) respectively. The lowest incidence was 1.7% in the month of April.

Conclusion: The incidence of appendicitis is high in the months from July to September with the lowest incidence is in the months of April and May. This information could be useful to decrease the disease-associated morbidity and mortality as well as it can be useful for hospital administration for enrolling the needed health-workers in those particular time periods.

Keywords: Appendicitis, Altitude, Seasons variation, Meteorology

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INTRODUCTION

Acute appendicitis is the most common general surgical emergency worldwide with life time risk for appendectomy 7.5 to 12%, commonly occurring in adolescent and young adults.^{1,2} The etiology of the appendicitis is still obscure and multifactorial. The disease has been attributed to a multiple causes which include inadequate fiber diet³, smoking⁴, mechanical obstruction of appendiceal lumen, radiation, sanitation, bacterial, viral and parasitic infestation^{5,6}. There are some evidences that shows appendicitis vary with climates seasons.⁷ Appendicitis presents throughout different month of the year, however, incidence increases is higher in particular months.⁸ There are many disparities in the incidence of acute appendicitis. Several studies have been done to assess the seasonal variation of acute appendicitis with variable result.⁹ However, Some authors reported high incidence of the cases in the summer month.^{10,11}

Although several epidemiological studies on appendicitis have been conducted, most have based on western and European population, with relatively fewer epidemiological studies have based on south Asian population. Most studies done on appendicitis were in well-equipped hospitals in urban areas of those countries, with relatively very few epidemiological studies on appendicitis have been conducted in rural high altitude of south Asian population.

There is very few or not at all research data concerning the monthly variation of acute appendicitis presenting in high altitude in Nepal, which geographic and climatic structure differ. The objective of this study is to observe the incidence of appendicitis variation with months of the year in such altitude region of Nepal.

MATERIALS AND METHOD

The cross sectional retrospective study was done in the Karnali Academy of Health Sciences, Jumla situated at the altitude above 2500 m from sea level. The approval was taken from IRC [Institutional Review Committee] of Karnali Academy of Health Sciences. The data were retrieved from the hospital record book of Operation Theater (OT) that included age, gender and ethnicity, month of the appendectomy performed, pre-operative clinical presentation and operative findings. The period of study was from July 2014 to March 2020. The appendectomies were performed both by open and laparoscopic techniques. The humidity, rainfall and temperature data were retrieved from the department of Hydrology and Meteorology, Surkhet Branch.

Inclusion criteria: All the appendicitis, clinically suspected and appendectomy performed were included in the study. Only the gross macroscopic findings of appendicitis during appendectomy such as congested vessels with reactive peritoneal fluids, abscess around the wall of appendix, fecolith,

perforated tip and body of appendix were only included.

Exclusion criteria: All the patients with appendicitis and appendicular lump treated with conservative method were excluded from the study. Normal appendixes were also excluded. The data were entered in Excel software, descriptive analysis were done with SPSS 16 Versions.

RESULTS

Total of 119 cases of appendectomy performed during 5 years period, from June 2014 to March 2020, in the surgery department of karnali academy of health sciences, Jumla were recorded. The mean age at was 27 ± 13.75 years. There were 53.78% female (n, 64) and male 46.21% (n,55) patients. The months in which the highest appendectomy executed were July/August/September and February with 16%, 13.4%, 12.6% and 13.4% respectively. The lowest incidence was 1.7% in the month of April along with May.

The lowest age at appendectomy in our study was 8 years. The highest age was 74 years. At age group 20-29 years was found to have highest percentage of appendicitis 29.4%, compared to other age group of same interval. The lowest number of appendicitis was 2.5% above 60 years. Ethnicity wise, high cast were found to have 78.1% of appendicitis, with female 53.3%.

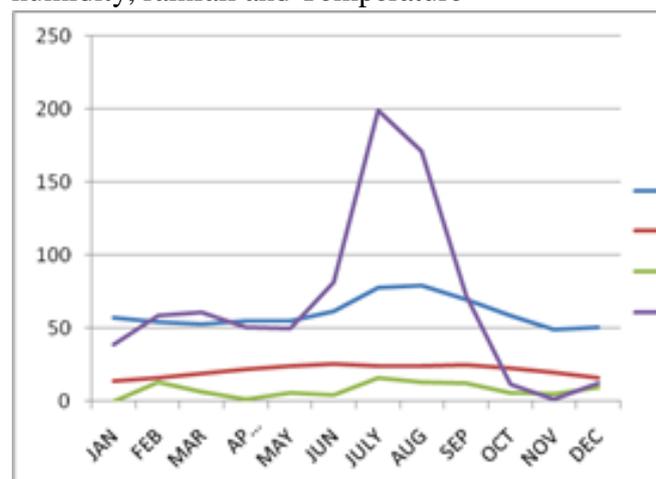
Table:1 Characteristic features of the patients

Characteristics	Frequency(N)		Total
	Male	Female	
1)Age			
<10	2(40)	3(60)	5(4.2)
10-19	11(36.)	19(63.3)	30(25.2)
20-29	15(42.9)	20(57.1)	35(29.4)
30-39	8(50)	8(50)	16(13.4)
40-49	15(62.5)	9(37.5)	24(20.2)
50-59	2(33.3)	4(66.7)	6(5.0)
>60	2(66.7)	1(33.3)	3(2.5)
Total	55(46.2)	64(53.7)	119(100)
2)Ethnicity			
Janjati	4(46.2)	6(53.8)	10(8.4)
High cast	43(46.7)	50(53.3)	93(78.1)
Low cast	7(40)	8(60)	15(12)
Terai cast	1(100)	0(0)	1(0.84)
Total	55(46.1)	64(53.7)	119(100)
3)Mean (years)			27 \pm 13.75
4)Lowest age			8 year
5)Highest age			76 year

Table 2: Showing the distribution of appendicitis in months

Months	Freq.(N)	Percent(%)
January	6	5.04
February	16	13.4
March	8	6.7
April	2	1.7
May	7	5.9
June	5	4.2
July	19	16
August	16	13.4
September	15	12.6
October	8	6.7
November	6	5.0
December	11	9.2
Total	119	100.0

Figure 1: Showing graph of appendicitis, humidity, rainfall and Temperature



DISCUSSION

Appendicitis is a common disease present throughout the year, worldwide,^{1,2} but some particular months are associated with high incidences, although this vary from region to region. A study in India by Babita et al. over a decade noticed the maximum cases was seen in summer especially in August and minimum number were found in the winter.¹² In a study conducted by Imre et al. in Finland showed the relation of acute appendicitis with the season with increased incidence in summer.¹³ In another study conducted at Taiwan by Lin et al. found the rates of appendicitis were 11.76% higher in the summer than in the winter months.¹⁴ Some authors from Canada and Tehran also reported the higher number of cases in summer.^{9,15}

However there are some reports which showed the incidence of appendicitis high in spring. Ashley has reported an excess of cases during spring, implicating a high prevalence of viral infection during these months¹⁶. Similar reports have been shown in the study by Sanda et al. implicating intense sandstorm as cause in the Spring months, in the Arabian Peninsula⁷.

In our study, high number of appendicitis cases 16%, 13% and 12% were found in the month of

July, August, and September respectively which is consistent with results from different studies done by several authors at different work place or region.^{8,17,18} The exact cause of increase appendicitis incidence was still in conjecture, however, many insidious factors might have been involved. The onset of the rainy season in this region started from July, the intensity of which increases toward the months of August and September is reflected on the data analysis of Jumla shown in Figure:1 [Courtesy by Metrological and forecasting Division, Surkhet Nepal]. On analyzing the pattern of rainfall and humidity, it has been revealed that rainfall and humidity is high in between July to September. The study by Gallerani et al. mentioned the possibility of various extrinsic factors such as humidity, rainfall, radiation, allergens, sun radiation, and viral and bacterial infection, role in the etiology of acute appendicitis.⁵ Others authors also have the same result.^{9,19} Khaevel et al. also reported the association of bacterial, viral and worm infestations in appendicitis,⁶ which apparently relates to seasons. Moreover, in the article “In the infectious disease outbreak in Nepal”, Karki et al.²⁰ mentioned the most common infectious microbes, which numbers become high during rainy seasons, are bacteria, virus and worms. Thus, it is obvious that during rainy season especially from July to September the activity of microbes increase which are associated with the increase in the appendicitis incidence. Poor personal hygiene has also been reported to be the cause of appendicitis.²¹ This region mostly has low quality drinking water system, poor sanitation and poor hygiene which become more jeopardized by rainfall, and often the infectious disease prevail in these months, from July to September. From our study, more appendicitis incidence were observed in July to September, in which rainfall, humidity, bacterial, viral and worm infestations were obviously prevailed. Until and unless other factors are involved or the exact cause is still in conjecture, it could be inferred there must

have an association of appendicitis incidence with the variation in the month in this altitude and environment.

In our study, the appendicitis is preponderance in the female with 53.7%. The age group of 20-29 years has the highest number 20(57.1 %) out of 35 females. In the ethnicity group, the high cast were predominant with 78.1% incidence in which female has 53.3% hold as shown in Table:1. The incidence of appendicitis is reported to be more in male with ratio ranging from 1.1-2.9:1,^{11,22} however, Shrestha et al. found female preponderance in the study.²³

High incidence cases were observed in Feb/March besides the months of rainy and humid period. The exact cause is not well established, however, the significant changes in the air temperature and sun radiation may have role in incidence of appendicitis, as Khavael et al.¹⁹ mentioned. February and March being the transient time, illustrated in the Figure:1, of changing from cold to the warm with variable in radiation might have association in the appendicitis cases increase in this month of year.

We observed an inexplicable result regarding the lowest incidence of appendicitis with 1.7% in the month of April/ May. The result is diverged from the previous published literature that mostly suggested increase appendicitis incidence in either summer or in spring with their particular involved etiogenesis factors.^{14,16} A systematic review of literature for the lowest incidence of appendicitis in seasonal variation was pursued, but none was found signifying lowest incidence in these months. On analyzing data in our study, it was found interesting that with lowest incidence of appendicitis there was lowest rainfall and humidity in the months April and May. It can be said or expected that people have lowest appendicitis incidence at altitude, especially in the month of April and May; however this need to be studied in further in large scale in randomized trial to gain the exact result to be

generalized. The study was carried out with the small number of patients, mostly from Jumla district and it is a retrospective study with no histological report as this facility is not available in hour hospital. These are the limitation of the study. These study further carried with perspective method including other factors would help decrease the limitation of the study.

CONCLUSION

The incidence of appendicitis is high in the months from July to September with low incidence in the months of the April and May. This information could be useful to decrease the disease associated morbidity and mortality in those particular period of time, taking extra preventive measures.

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