



Prevalence of GI helminths of cattle in low lying and marshy areas of Kashmir valley

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Received: 19 September 2018; Accepted: 9 October 2018

ABSTRACT

The study was conducted to find out the prevalence of gastrointestinal (GI) helminths in cattle of low lying and marshy areas of Kashmir valley over a period of one year. The qualitative faecal examination of 885 samples revealed an overall prevalence of GI helminths to the tune of 37.06% comprising 7.80% trematodes, 4.29% cestodes and 31.98% nematodes. Prevalence of paramphistomes (7.34%) was more than that of *Fasciola* spp (0.45%). Among cestodes, the only genus reported was *Moniezia* spp (4.29%). In nematodes, maximum prevalence was observed for strongyle worms (31.19%) followed by *Strongyloides* spp. (1.24%) and *Trichuris* spp (0.57%). Seasonal variation of GI helminths revealed significantly highest prevalence in autumn (50%) followed by spring (41.62%), summer (33.99%) and winter (25.50%). Overall prevalence of GI helminths was significantly higher in young cattle (64.62%) than adults (32.32%). Significantly higher prevalence of GI helminths was observed in males (50.53%) as compared to females (35.44%). Mean intensity of GI nematodes ranged from 0 to 350 with an average of 177.41±28.25 eggs per gram (EPG). Significantly highest mean intensity of GI nematodes was found in summer (173.61±46.70) followed by spring (148.88±56.70), autumn (113±11.34) and winter (95.83±33.24). Mean EPG in young cattle (192.71±27.20) was significantly higher than that of adults (162.11±29.30). Sex had non-significant influence on intensity of GI nematodes. On the basis of above study, it can be concluded that the prophylactic dosing of cattle against trematodes should be done during late autumn and late winter or early spring. Similarly prophylactic de-worming of animals in mid-autumn, mid-spring and mid-summer shall be useful in preventing production losses. However, it will be better to use broad spectrum drug which is effective against trematodes, cestodes as well as nematodes to avoid frequent dosing.

Key words: Cattle, GI helminths, Kashmir, Marshy areas, Prevalence

Dairy animals play an important role in converting low quality plant materials from the graze lands to high quality human food (Kalyanasundaram 2014). Milk is the primary source of income from cattle rearing in India but the production is not at all optimum given the huge cattle resources India possesses. The main reasons for low productivity and quality are poor exploitation of genetic potential of indigenous animals, low absorption of available technology, inadequate resource of feed and fodder, insufficient health cover besides diseases including parasitic diseases (Aiman 2014). Parasitic infections especially GI helminths pose a serious health threat and limit the productivity of livestock due to the associated morbidity, mortality, cost of treatment and control measures (Lashari

et al. 2011). The incidence of GI parasitic infections in ruminants of India has been reported by many workers (Kaur and Kaur 2008, Choubisa and Jaroli 2013, Verma and Jaiswal 2017), ranging between 25 to 78% (Bandyopadhyay *et al.* 2010) and it is a well established fact that controlling parasitic infections in animals can substantially increase their body weight and productivity (Fitzpatrick 2013). In order to develop suitable control measures for parasitic diseases, there is a need to map out the parasitic fauna of cattle from every geographic zone of the world as local climatic conditions of an area and the prevailing managerial practices mainly affect the prevalence of these parasites. The incidence of parasitic infections in dairy cattle from Jammu region had been reported by Raina *et al.* (1999), Yadav *et al.* (2005) and Mir *et al.* (2013) and from Kashmir valley by Sharma *et al.* (1989), Mir *et al.* (2003), Pandit *et al.* (2004), Hafiz *et al.* (2011), Fatima *et al.* (2012), Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) but none of these studies are focused on low lying and marshy areas that are hot spots for parasitism, especially dreaded trematodal diseases like fasciolosis and

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amphistomosis. Therefore, the present study was undertaken to work out the prevalence of GI helminths of cattle in low lying and marshy areas of Kashmir valley to evolve a package of practices for control of these parasites.

MATERIALS AND METHODS

Study area: The study was conducted on locally reared cattle in low lying and marshy areas (Lasjan, Kenihama, Nowgam, Humhama, Narkara, Bemina, Sharifabad, Narbal, Pattan, Haigam, Hajan, Sumbal, Shepora, Telbal, Babi Demb, Sopore, Baba Shakur ud din, Sambur, Kakapora, Dangarpora, Banderpora, Sangam) of Kashmir valley. The valley is bounded on all sides by mountains and average height of the valley is 1850 metres above sea level. The climate of the valley is temperate cum mediterranean type and in the higher reaches, the temperature remains cold throughout the year. There are as many as 36 wetlands in the state with widespread marshy bank areas constituting 3.5% of the total geographical area.

Parasitological examination: Faecal samples (885) were collected randomly from locally reared cattle of both the age groups (< 1 year as young and > 1 year as adult) and of either sex. The samples were collected directly from the rectum and brought to the laboratory in mini polythene bags for examination. The samples were collected in all the four seasons, viz. autumn (September–November), winter (December–February), spring (March–May) and summer (June–August).

The samples were first examined grossly for colour, consistency, presence of blood, mucus and dead worms followed by standard sedimentation and floatation techniques (Soulsby 1982). Randomly selected 25% positive faecal samples in each season from either sex including both the age groups were examined by quantitative techniques (Stoll's dilution method and Modified Mc Master's technique) to determine the parasitic load, i.e. EPG (Eggs per gram of faeces) (Soulsby 1982).

Statistical analysis: The results were subjected to standard statistical analysis as per Snedecor and Cochran (1994). Unpaired P test with Welch's correction, F test to compare variances and chi square test were employed to determine whether differences between various parameters within and between groups were statistically significant or nonsignificant.

RESULTS AND DISCUSSION

The present study revealed an overall prevalence of GI helminths in cattle to the tune of 37.06% (Table 1). Kobak and Pilacyzk (2012) also reported almost similar prevalence of 48% in low lying and marshy area of Noteka Forest region in Poland. However results differed from that of Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) who reported an overall prevalence of 78.02%, 59.86% and 68.96% in cattle of Central, North and South Kashmir, respectively. The variation in the present study might be due to differences in geographical locations, i.e. marshy

and low lying areas versus other areas of the valley, climatic conditions of the study area, sample size and managemental practices involved.

In present study, prevalence of trematodes was 7.80% (Table 1) which is lower than reported by Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) in central, north and south zones of Kashmir valley, respectively. Amongst the trematodes, prevalence of paramphistomes was 7.34% (Table 1). Akthar-uz-zaman *et al.* (2013) also reported almost similar prevalence of amphistomes in cross bred cattle in water logged areas of Bangladesh, but lower than the prevalence reported by Kobak and Pilacyzk (2012) in marshy areas of Noteka forest region in Poland. Prevalence of paramphistomes in the present study also differed from Bushra *et al.* (2013) and Irshad *et al.* (2018) who reported prevalence of paramphistomes as 13.12% and 11.26% among cattle from different areas of Kashmir valley but corresponds with that of Aiman *et al.* (2017) who reported prevalence of 7.10% in cattle of north zone of Kashmir valley. The prevalence of *Fasciola* spp. found in this study was very low (Table 1) and differs from Pandit *et al.* (2004) who reported prevalence of *Fasciola* spp. to the tune of 19.41% in field managed cattle from various areas of Kashmir valley. Similarly, Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) had reported prevalence of 16.45%, 4.53% and 2.06% in central, north and south zones of Kashmir valley respectively. The reason for lower incidence of *Fasciola* spp. in low lying and marshy areas of Kashmir valley is due to increased awareness about fasciolosis amongst the farmers and increased focus by developmental departments in targeting fasciolosis in these areas. Among cestodes, the only genus reported was *Moniezia* spp. with prevalence of 4.29% (Table 1). In Kashmir valley, almost similar prevalence of 4.16% and 4.44% had been reported by Bushra *et al.* (2013) and Aiman *et al.* (2017) in cattle from central and north zones, respectively. However, results differed from Irshad *et al.* (2018) who reported prevalence of *Moniezia* spp. to the tune of 7.99% in south Kashmir.

Overall prevalence of nematode parasites in the present study was 31.98%. Among nematodes, maximum prevalence was recorded for strongyle worms followed by *Strongyloides* spp. and *Trichuris* spp. (Table 1). The predominance of strongyle group of worms over the other nematodes noted in the present study had also been reported by Bushra *et al.* (2013) in central Kashmir, Aiman *et al.* (2017) in north Kashmir and Irshad *et al.* (2018) in south Kashmir. The highest prevalence of nematodes particularly strongyle worms in the present study is due to the fact that these worms are prolific egg layers and take lesser time for completion of life cycle and thus grazing areas become heavily infected with the larvae of strongyle worms within a period of fortnight. Prevalence of *Strongyloides* spp. was more than that of *Trichuris* spp. in the present study (Table 1). The results are in agreement with Akhtar-uz-zaman (2013) and Laha *et al.* (2013) who reported predominance of *Strongyloides* spp. over *Trichuris* spp. from water logged

Table 1. Factor-wise prevalence of GI helminths in cattle of low lying and marshy areas of Kashmir valley

| Factor/Host | No. examined | No. positive for GI helminthes | Trematodes | | | Cestodes | | Nematodes | | | Mixed infection | |
|--------------------|--------------|--------------------------------|---------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|------------------------------|----------------------------|---------------------------|------------------------------|-----------------------------|
| | | | F | P | Total | M | Total | S | St | T | | Total |
| <i>Season-wise</i> | | | | | | | | | | | | |
| Butumn | 182 | 91 (50.00 ^b) | 3 (1.65 ^b) | 3 (1.65 ^b) | 6 (3.30 ^b) | 7 (3.85 ^b) | 7 (3.85 ^b) | 79 (43.40 ^b) | 3 (1.65 ^b) | 2 (1.09 ^b) | 77 (42.31 ^b) | 2 (1.09 ^b) |
| Winter | 200 | 51 (25.50 ^b) | 4 (2.00 ^b) | 14 (7.00 ^a) | 18 (9.00 ^a) | 15 (7.50 ^b) | 15 (7.50 ^b) | 36 (18.00 ^b) | 1 (0.50 ^b) | 2 (1.00 ^b) | 38 (19.00 ^b) | 11 (5.50 ^b) |
| Spring | 197 | 82 (41.62 ^b) | 2 (1.02 ^b) | 27 (13.71 ^a) | 29 (14.72 ^a) | 12 (6.09 ^b) | 12 (6.09 ^b) | 75 (38.07 ^b) | 7 (3.55 ^b) | 0 (0.00 ^b) | 75 (38.07 ^b) | 25 (12.69 ^b) |
| Summer | 306 | 104 (33.99 ^b) | 0 (0.00) | 21 (6.86 ^a) | 21 (6.86 ^a) | 4 (1.31 ^b) | 4 (1.31 ^b) | 94 (30.72 ^b) | 0 (0.00 ^b) | 1 (0.33 ^b) | 94 (30.72 ^b) | 16 (5.23 ^b) |
| <i>Age-wise</i> | | | | | | | | | | | | |
| Adult | 755 | 244 (32.32 ^a) | 2 (0.26 ^a) | 62 (8.21 ^a) | 64 (8.48 ^a) | 27 (3.58 ^a) | 27 (3.58 ^a) | 203 (26.89 ^a) | 10 (1.32 ^a) | 5 (0.66 ^a) | 209 (27.68 ^a) | 9 (1.19 ^a) |
| Young | 130 | 84 (64.62 ^b) | 2 (1.54 ^a) | 03 (2.31 ^b) | 05 (3.85 ^b) | 11 (8.46 ^b) | 11 (8.46 ^b) | 73 (56.15 ^b) | 01 (0.77 ^a) | 0 (0.00 ^a) | 74 (56.92 ^b) | 15 (11.54 ^b) |
| <i>Sex-wise</i> | | | | | | | | | | | | |
| Male | 95 | 48 (50.53 ^a) | 0 (0.00 ^a) | 4 (4.21 ^a) | 4 (4.21 ^a) | 9 (9.47 ^a) | 9 (9.47 ^a) | 48 (50.53 ^a) | 1 (1.05 ^a) | 1 (1.05 ^a) | 48 (50.53 ^a) | 9 (9.47 ^a) |
| Female | 790 | 280 (35.44 ^b) | 4 (0.51 ^a) | 61 (7.72 ^a) | 65 (8.23 ^b) | 29 (3.67 ^b) | 29 (3.67 ^b) | 228 (28.86 ^b) | 10 (1.27 ^a) | 4 (0.51 ^a) | 234 (29.62 ^b) | 22 (2.78 ^b) |
| Overall/Total | 885 | 328 (37.06) | 4 (0.45) | 65 (1.68) | 69 (7.8) | 38 (4.29) | 38 (4.29) | 276 (31.19) | 11 (1.24) | 8 (0.57) | 283 (31.98) | 24 (2.71) |

Figures within parenthesis indicate percentage. Values with different superscript in a column under a subgroup vary significantly ($P < 0.05$). F, *Fasciola* spp.; P, Paramphistomes; M, *Moniezia* spp.; S, strongyle worms; St, *Strongyloides* spp.; T, *Trichuris* spp.

areas in Bangladesh and organized farms of Meghalaya, respectively.

Seasonal prevalence: The prevalence of GI helminths was observed highest in autumn followed by spring, summer and winter, the variation being statistically significant ($P < 0.05$) between autumn and winter, winter and spring, spring and summer and autumn and summer (Table 1). This is in accordance with the findings of Yadav *et al.* (2005) who observed highest prevalence of GI helminths in rainy season at Jammu. In Kashmir valley, lower prevalence of GI helminths in winter season had been reported by Aiman *et al.* (2017) and Irshad *et al.* (2018) from north and south zones of Kashmir valley, respectively. However results differed from that of Pandit *et al.* (2004) and Bushra *et al.* (2013) who reported highest prevalence during winter (78.5% and 86.5%, respectively) season. In the present study, low prevalence of GI helminths in winter season could be due to hypobiosis and overwintering of parasitic stages because of lowered environmental temperature and when spring/summer arrives, there is resumption of development of hypobiotic larvae as well as overwintered larvae in grazing areas and thus establishment of heavy infections.

The prevalence of trematodes was higher in spring followed by winter, summer and autumn, the variation being statistically significant ($P < 0.05$) between autumn and winter, autumn and spring, and autumn and summer (Table 1). The results are in agreement with the findings of

Yadav *et al.* (2010) who reported highest prevalence of trematodes in spring in Delhi. Amongst the trematodes, prevalence of paramphistomes was highest in spring followed by winter, summer and autumn, the difference being statistically significant ($P < 0.05$) between autumn and winter, autumn and spring, and autumn and summer (Table 1). The results are in agreement with findings of Aiman *et al.* (2017) and Irshad *et al.* (2018), who reported highest prevalence of paramphistomes in spring season in north and south zones of Kashmir valley, respectively. This can be attributed to the fact that during spring environmental conditions in Kashmir valley are very favourable for hatching of ova, survival of snails and viability of encysting metacercariae. *Fasciola* spp. was highest in winter season followed by autumn and spring, the variation being statistically nonsignificant ($P > 0.05$) between the seasons (Table 1). Higher prevalence of *Fasciola* spp. in winter had also been reported by Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) in central, north and south zones of Kashmir valley, respectively. The reason for highest prevalence in winter is due to the fact that environmental conditions in Kashmir in summer and autumn are very favourable for hatching of eggs and longevity of metacercariae of *Fasciola* spp. The animals actually pick up the infection during summer and early autumn and parasites reach to sexual maturity in bile ducts during winter after migrating through the peritoneal cavity and liver parenchyma and, therefore, egg detection becomes

possible. Prevalence of *Moniezia* spp. was highest in winter followed by spring, autumn and summer, the difference being statistically significant between autumn and summer, winter and summer, and spring and summer (Table 1). The results are in agreement with the findings of Bushra *et al.* (2013) who reported highest prevalence of *Moniezia* in winter season. However results differed from that of Aiman *et al.* (2017) and Irshad *et al.* (2018) who reported highest prevalence of *Moniezia* spp. in autumn (6.07%) and spring (13.52%) in north zone and district Pulwama of Kashmir valley, respectively.

Prevalence of nematodes was highest in autumn followed by spring, summer and winter, the variation being statistically significant ($P < 0.05$) between autumn and winter, winter and spring, and winter and summer (Table 1). The results are in line with Aiman *et al.* (2017) who observed highest prevalence of nematodes in spring and Irshad *et al.* (2018) who reported lowest prevalence of nematodes in winter season. However, results differed with Bushra *et al.* (2013) who reported highest prevalence of nematodes in winter season in central zone of Kashmir valley. After winter period, spring rise is evident and in Kashmir valley having temperate type of climate the rainy season starts in spring making environmental conditions more favourable for the development and survival of pre-parasitic stages of nematodes, resumption of development of hypobiotic larvae and availability of overwintered larvae on herbage leading to overall increased availability of infective larvae in spring season. The prevalence of strongyle worms was highest in autumn followed by spring, summer and winter, the variation being statistically significant ($P < 0.05$) between autumn and winter, spring and winter, and summer and winter. Highest prevalence of *Strongyloides* spp. was found in spring followed by autumn and winter, the variation being statistically significant ($P < 0.05$) between winter and autumn, spring and autumn, and summer and autumn. *Trichuris* spp. also showed non-significantly ($P > 0.05$) higher prevalence in autumn followed by winter and summer season (Table 1).

Age-wise prevalence: In the present study, it was observed that overall GI helminth infection was lower among adults as compared to young cattle, the variation being statistically significant ($P < 0.05$) (Table 1). The results are in agreement with those of Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018), who also reported higher prevalence of GI helminths in young cattle compared to adult cattle in central, north and Pulwama district of south Kashmir, respectively.

Significantly ($P < 0.05$) higher prevalence of trematodes was reported in adults as compared to young ones in the current study (Table 1). This is in accordance with Bushra *et al.* (2013) in central Kashmir, Aiman *et al.* (2017) in north Kashmir and Irshad *et al.* (2018) in district Pulwama of south Kashmir. This can be due to the fact that young animals are less grazed in water logged areas compared to adults, as a result they are least exposed to infective stages of trematodes. This could also be because of built up of

infection in adults due to repeated exposures. Prevalence of paramphistomes was significantly ($P < 0.05$) higher in adults than young cattle (Table 1). This is in agreement with Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) in central, north and south zones of Kashmir valley, respectively. *Fasciola* spp. was non-significantly ($P > 0.05$) higher in young ones compared to adults (Table 1). The results of the present study differed from that of Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018) who reported prevalence of *Fasciola* spp. more in adults than young ones in central, north and south Kashmir, respectively. *Moniezia* spp. infection was significantly ($P < 0.05$) higher in younger animals as compared to adults (Table 1). Higher prevalence of *Moniezia* spp. in young cattle has also been reported by Bushra *et al.* (2013) in central Kashmir, Aiman *et al.* (2017) in north Kashmir and Irshad *et al.* (2018) in district Pulwama of Kashmir valley. It is a universally accepted that lambs, kids and calves under six months of age are substantially infected by tapeworms in general and *Moniezia* spp. in particular as compared to adults due to development of immunity by the latter.

Prevalence of nematodes was significantly ($P < 0.05$) higher in young cattle in comparison to adult cattle (Table 1). These findings are in agreement with Bushra *et al.* (2013), Aiman *et al.* (2017) and Irshad *et al.* (2018), who also reported higher prevalence of GI nematodes in calves than adults. Strongyle worms were also significantly ($P < 0.05$) higher in young cattle in comparison to adults. These findings are in line with the findings of Bushra *et al.* (2013) in central Kashmir, Aiman *et al.* (2017) in north Kashmir and Irshad *et al.* (2018) in south Kashmir. Higher prevalence of *Strongyloides* spp. was observed in adults than young ones and the difference was statistically non-significant ($P > 0.05$). *Trichuris* spp. was reported only in adult cattle (Table 1). The low incidence of nematode infection in adults as compared to younger animals is due to development of immunity because of repeated exposures (Irshad *et al.* 2018).

Sex-wise prevalence: Overall prevalence was significantly ($P < 0.05$) higher in males as compared to females, the variation being statistically significant ($P < 0.05$) (Table 1). The results of present study are in line with Irshad *et al.* (2018), who also observed higher prevalence of GI parasites in males than females in Pulwama District of Kashmir valley. However results disagree with Aiman *et al.* (2017) who found higher prevalence in females compared to males in north Kashmir. Trematodal infection was found higher in females in comparison to males (Table 1). These findings are in line with the study of Bushra *et al.* (2013) and Irshad *et al.* (2018), who also observed higher prevalence of trematodes in females as compared to males. *Fasciola* spp. and paramphistomes were observed higher in females than males, the variation being statistically non-significant (Table 1). Higher prevalence of trematodal infection in females in general is attributed to physiological stresses like pregnancy and lactation which results in temporary relaxation in immunity. *Moniezia* spp. was higher

in males compared to females, the difference being statistically significant ($P < 0.05$) (Table 1). This is in agreement with that of Irshad *et al.* (2018), who also reported higher prevalence of *Moniezia* spp. in males as compared to females.

In the present study, the prevalence of nematodes was higher in males in comparison to females, the variation being statistically significant ($P < 0.05$). Strongyle worms were significantly ($P < 0.05$) higher in males than females. *Strongyloides* spp. was higher in females than males, the variation being statistically nonsignificant, however *Trichuris* spp. was nonsignificantly ($P > 0.05$) higher in males than females (Table 1). Our findings are in agreement to that of Irshad *et al.* (2018), who also observed higher prevalence of nematodes amongst males in district Pulwama of south Kashmir. The males in the present study were mostly of young ones, so higher infection was obtained in males as compared to females because young ones are more susceptible to infection compared to adults due to underdeveloped immune system.

Intensity of strongyle infection: EPG in the present study ranged from 0 to 350 with mean of 177.41 ± 28.25 EPG. Mean parasitic load was highest in summer followed by spring, autumn and winter, the variation being statistically significant ($P < 0.05$) between summer and autumn, summer and winter, autumn and spring, and autumn and summer (Table 2). Our findings are in agreement with Irshad *et al.* (2018) who reported highest EPG in summer season. The mean parasitic load was found significantly ($P < 0.05$) higher in young ones than adults (Table 2). Our findings are in agreement with Bushra *et al.* (2013) and Aiman *et al.* (2017) who also observed higher infection in young cattle in central and north zones of Kashmir valley, respectively. This might be due to the development of acquired immunity by the adults as compared to young ones in which immune system is not fully developed. The mean parasitic load was non significantly ($P > 0.05$) higher in females than males (Table 2) which is in line with Bushra *et al.* (2013), Aiman

et al. (2017) and Irshad *et al.* (2018), who also reported higher EPG amongst females in central, north and District Pulwama of Kashmir valley, respectively.

The reason for higher EPG in females is because females experience periparturient rise in faecal egg counts due to pregnancy and lactation stress. In lactating animals there is also marked increase in susceptibility to newly acquired infections (Shubber *et al.* 1981).

ACKNOWLEDGEMENTS

The authors are highly thankful to the people of marshy zones of Kashmir valley for allowing collection of copro samples from their animals. The authors are highly thankful to Dr. Mohd Ashraf Baba (SHD, Kashmir) for statistical analysis of the data. The help rendered by the officials of the Division of Veterinary Parasitology is also gratefully acknowledged.

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Table 2. Factor-wise comparison of parasitic load of GI helminths of cattle in low lying and marshy areas of Kashmir valley

| Factor/Host | No. examined | Range | Mean EPG |
|--------------------|--------------|---------|---------------------------|
| <i>Season-wise</i> | | | |
| Autumn | 47 | 0–200 | 113±11.34 ^a |
| Winter | 48 | 0–100 | 95.83±33.24 ^a |
| Spring | 54 | 100–200 | 148.88±56.70 ^b |
| Summer | 54 | 0–350 | 173.61±46.70 ^b |
| <i>Age-wise</i> | | | |
| Adult | 163 | 100–350 | 162.11±29.30 ^a |
| Young | 40 | 0–200 | 192.71±27.20 ^b |
| <i>Sex-wise</i> | | | |
| Male | 20 | 0–200 | 121.17±32.50 ^a |
| Female | 183 | 0–350 | 233.65±24.00 ^a |
| Overall/Total | 203 | 0–350 | 177.41±28.25 |

Values with different superscript in a column under a subgroup vary significantly ($P < 0.05$).

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