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Original Research Article

Urine Analysis of School Age Children of Dharan Municipality, Nepal

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ABSTRACT

Introduction: A urine test checks different components of urine, a waste product made by the kidneys. A regular urine test may be done to help for finding the cause of symptoms. The test can give information about our health and problems we may have.
Objectives: -To assess the prevalence of urinary abnormalities in school-aged children of Dharan Municipality, Nepal.
- To provide report of the urine analysis to the students which may help for their further health consciousness?
Methods: Cross sectional, purposive sampling study of 200 urine samples of school age children (≤10 years) of different schools was done.
Results: 54% and 46% were male and female subjects among which the lowest and highest age was 5 and 10 years respectively. Most common pH finding was 6.0, yellow color followed by straw color and clear white respectively. Highest specific gravity of urine was 1.015(80%) followed by 1.020 (44%). Ketone bodies and bilirubin positivity were found in single sample each. 7% of urine samples had bacteriuria along with 13 cases showed nitrite positivity. Two urine samples had trace amount, while one showed 1+ amount of glucose.
The frequency of leukocyturia showed trace, 1+ and plenty amount in nine, three and in one individuals respectively. Hematuria was found to be seen in 8% cases with 2+ in one individual. Eight students had positive protein value, of which seven had trace and one had 1+ in amount. One student had plenty of epithelial cells followed by 1+ and trace amount of epithelial cells by two and five students respectively. One had dumble shaped crystals followed by two having each of amorphous, phosphate, calcium oxalate and uric acid crystals respectively. The cross tabulations between the gender with presence of RBCs, WBCs, occurrence of heamaturia and bacteriuria showed significant p-values.
Conclusion: Mass urinary screening proved to be a useful tool to identify children with asymptomatic progressive renal diseases. Furthermore, the delivery of the report and counseling them for further preventive measures may also help in improving their condition.

Key Words: Urine analysis, School-aged children, Urine sample,

INTRODUCTION

Urinalysis is a diagnostic physical, chemical and microscopic examination of a urine sample. [1] Specimens can be obtained by normal emptying of the bladder (voiding) or by a hospital procedure called catheterization. A complete urinalysis includes physical, chemical, and microscopic examinations. Midstream clean urine collection is the best specimen, but the specimen should be examined within two hours of collection. [2] Urinalysis is performed for several reasons. The diagnosis of metabolic, endocrine or

systemic diseases that affect kidney function requires twenty-four hour urine studies result. Likewise, it is required for continues monitoring of the diabetic patient, tests for pregnancy and screening for drug abuse even. Finally, the urine examination is even indicated for the general evaluation of health. [1]

A urine test checks different components of urine, a waste product made by the kidneys. A regular urine test may be done to help for finding the cause of symptoms. The test can give information about our health and problems we may have. The kidney stake out waste material, minerals, fluids, and other substances from the blood to be passed in the urine. Urine has hundreds of different body wastes. The parameters that are usually measured or quantified in urinalysis [3] are: color, clarity, odor,' specific gravity, pH, protein, glucose, nitrite, leukocyte esterase, ketone bodies, RBCs, WBCs, bacteria, yeast, parasite and epithelial cells.

Mass urinary screening is a useful tool to identify children with asymptomatic progressive renal diseases. A dipstick urinalysis screening should be conducted to detect such prevalence and to set up a more effective screening program for children. Asymptomatic urinary abnormalities might be detected by urine screening program at school age. Further work-up should be offered to define the exact etiology of any abnormal finding and to determine whether early detection of renal disorders in childhood will lead to effective interventions and reduction in the number of individuals who develop end-stage renal disease. [1]

OBJECTIVES

The main objective of this study is:

- To assess the prevalence of urinary abnormalities in school-aged children of Dharan Municipality.
- To provide the report of the urine analysis to the students which may help for their further health consciousness.

MATERIALS AND METHODS

This cross sectional study design was set in the Hematology laboratory of Pathology department of BPKIHS, Dharan, Nepal. 200 urine samples of school age children of Dharan municipality studying in different schools were taken. The inclusion criteria were of urine samples of school children below 10 years of age. The purposive sampling technique method was used in the study design. The protocol of the study was approved by the Institute Ethics Committee and informed written consent was obtained from parents and the school administration. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki.

Urine was collected in a clean and dry container that allows complete immersion of all the fields on the test strips. The specimen was tested with the urine strip as soon as possible by dipping it in urine for 1-2 seconds. Then the specimen was centrifuged for microscopic analysis. Some immediate testing was not possible, so the sample was stored in the refrigerator. But was not frozen and again the specimen was brought to room temperature before using it in the test. After the urine was centrifuged, the sediments of the centrifuged urine was kept under microscope of 40x magnification and observed for microscopic analysis.

Various parameters like glucose, pH, specific gravity, protein, nitrites, urobilinogen, ketones, bilirubin and leukocytes was looked upon and analyzed for physical (by test strips) as well as microscopic examination of every urine sample.

RESULTS

A cross sectional study of urine analysis among the school aged children below 10 years was done in two schools of Dharan municipality from June to August 2013. Among the 200 urine samples, various parameters were analyzed by the urine test strips as well as microscopically in the Department of Hematology, BPKIHS,

Dharan. The following results were obtained.

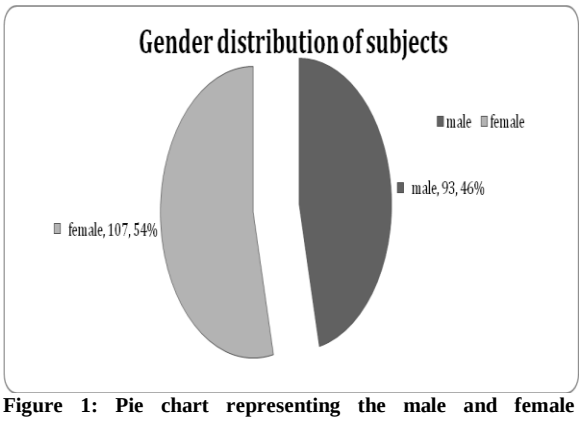


Figure 1: Pie chart representing the male and female population in our study.

The above pie chart shows the percentage of male subjects and female subjects enrolled in our study were 54% and 46% respectively. This clearly shows that the female population is higher than the male.

Table 1. Table representation of statistical value of age i.e., Mean, Median and Mode of the age of school children taken in our study.

Age of the students			
Years		Frequency	Frequency %
	< 5	7	3.5
	5- 6	20	10.0
	6-7	35	17.5
	7- 8	66	33.0
	8- 9	50	25.0
	9- 10	22	11.0
	Total	200	100.0

The above table shows that the Mean age of our study was 7.99 ±1.260 whereas median age was 8.00. The lowest age taken was 5 years whereas the highest age was 10 years in our study which justifies to our study criteria.

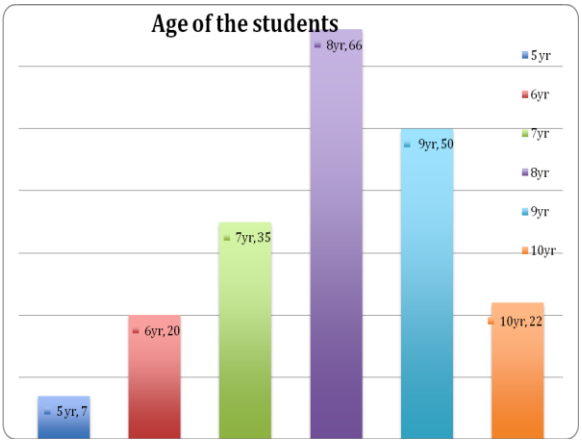


Figure 2: Bar graph representing the age of the students taken in our study.

Above stated graph shows the frequency of various ages of the students undertaken in our study. The lowest age taken was 5 years whereas the highest age was 10 years in our study, justifying our study criteria.

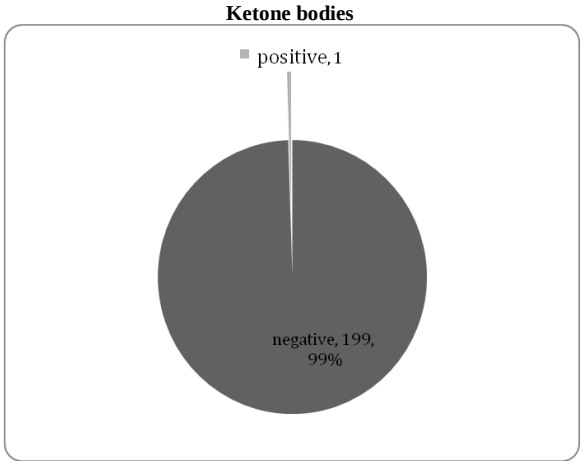


Figure 3: Chart diagram representing the frequency of urine sample with positive and negative ketone bodies in our study.

Above pie chart shows that, only one urine sample was found to be positive with the ketone bodies.

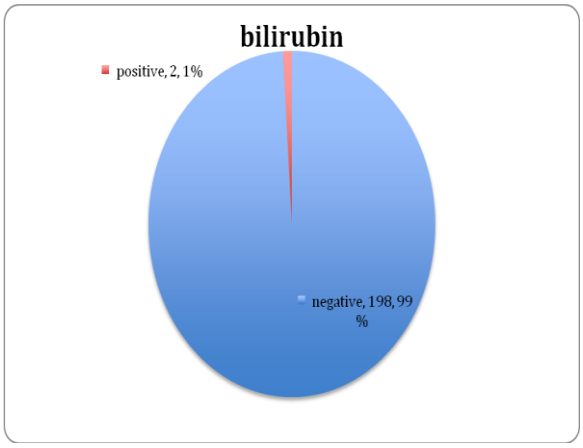


Figure 4: Pie chart representation of the bilirubin positive and negative students in our study.

Here, the pie chart shows that, only 1 % of the urine sample was found to be bilirubin positive whereas 99% was found to be bilirubin negative.

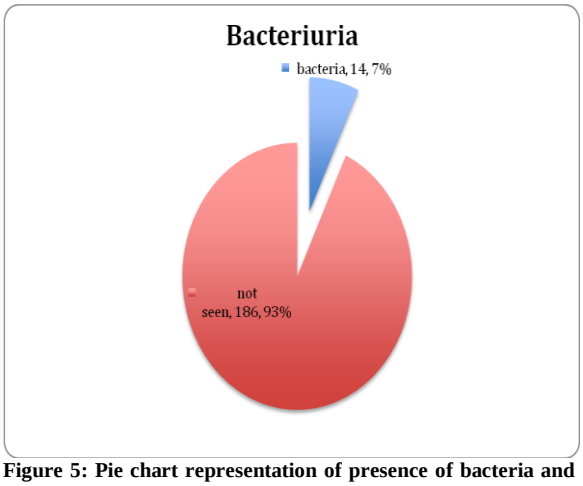


Figure 5: Pie chart representation of presence of bacteria and its absence in the urine of the students enrolled in our study.

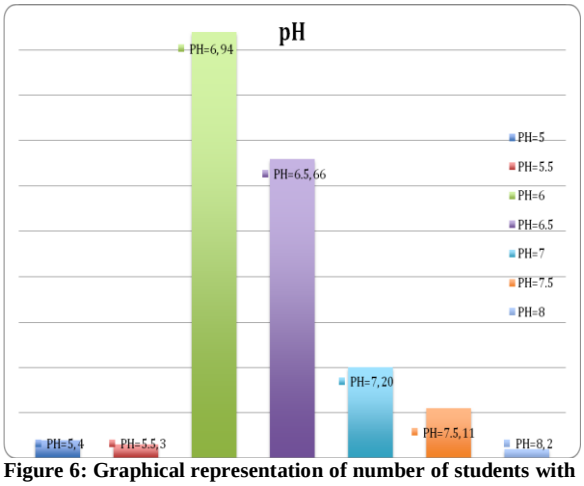


Figure 6: Graphical representation of number of students with their respective pH value in our study.

Above pie chart has clearly illustrated that 7% of urine samples in our study had bacteriuria, while rest of the 93% were sterile.

The above bar graph shows the most common pH is 6.0. Also, it represents that alkaline pH value are also present in the urine samples of our study.

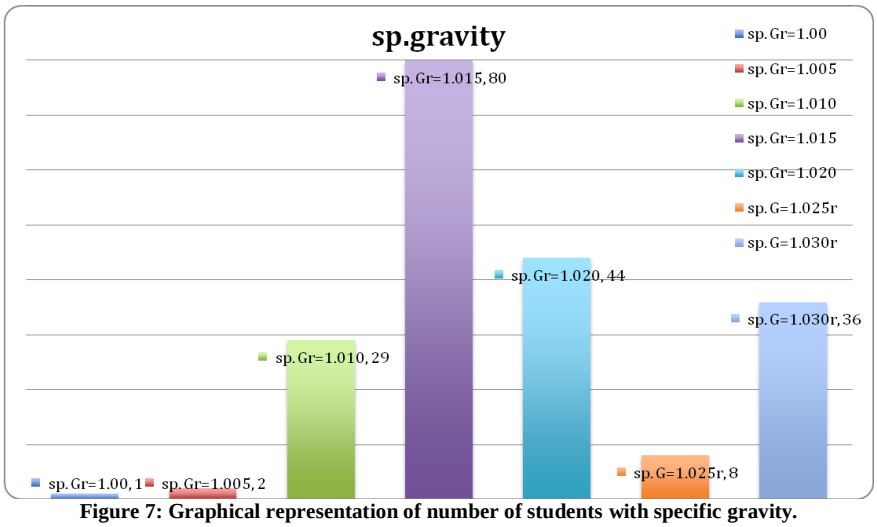


Figure 7: Graphical representation of number of students with specific gravity.

The highest specific gravity in our study is 1.015(80%) followed by 1.020 (44%).

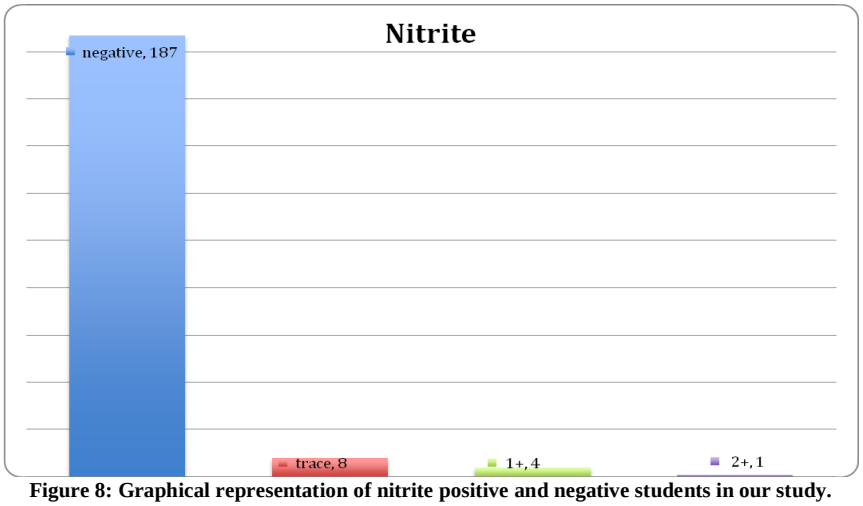


Figure 8: Graphical representation of nitrite positive and negative students in our study.

In the above bar graph, shows about the predominant nitrite negative cases in our study.

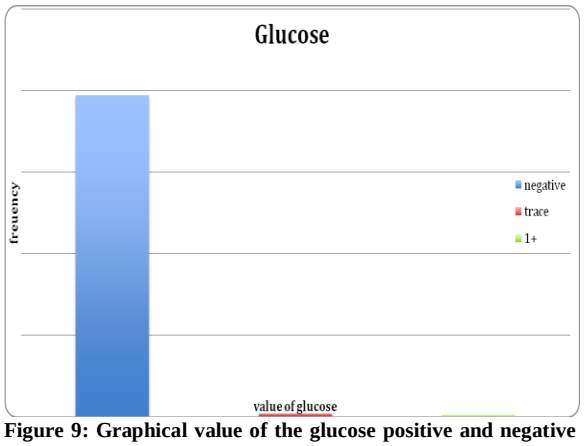


Figure 9: Graphical value of the glucose positive and negative cases in our study.

The above graph represents that two urine samples has trace amount of glucose while one shows 1+ amount of glucose. And the remaining 197 are glucose negative.

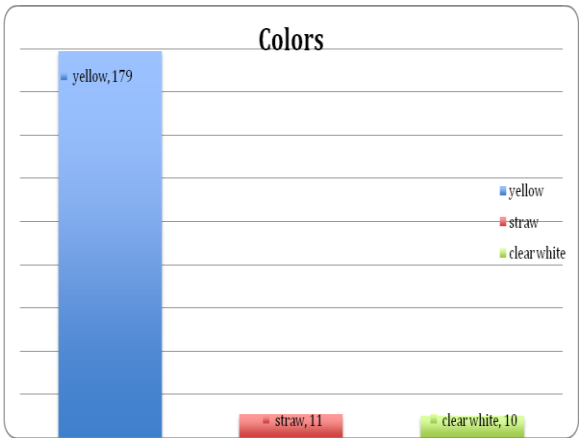


Figure 10: Graphical representation of different types of color of urine seen in our study.

Above graph shows the yellow color urine was found to be the highest in number.

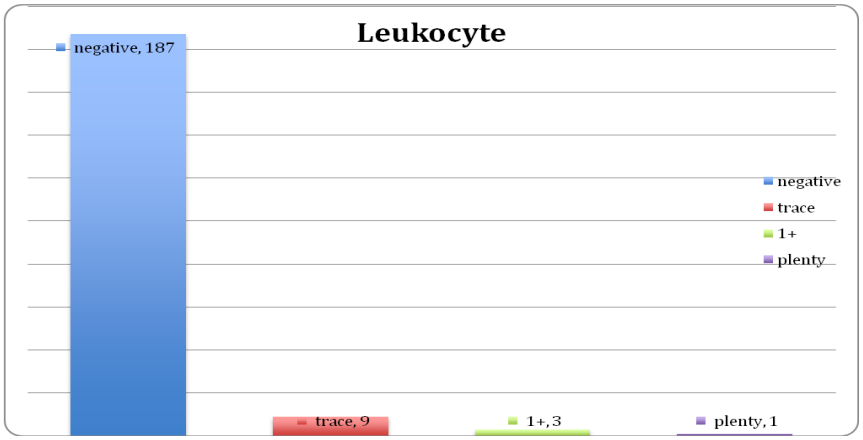


Figure 11: Graphical representation of leukocyte presence in the student urine samples of our study.

Above graph has illustrated that, the trace amount was seen in 9 individuals, (1+) in 3 individuals while plenty amount was detected in one student.

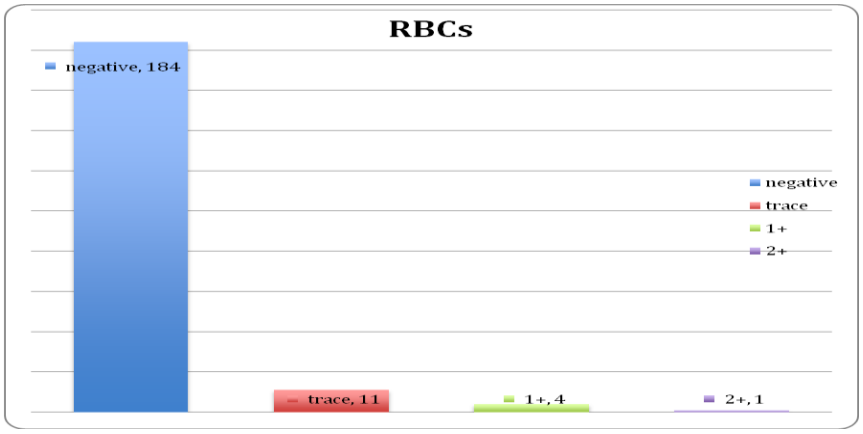


Figure 12: Graphical representation of hematuria in students enrolled in our study.

Hematuria was seen in 8% cases with 2+ in one individual. Also hematuria has significant distribution on the basis of gender 'p'<0.05 (0.038).

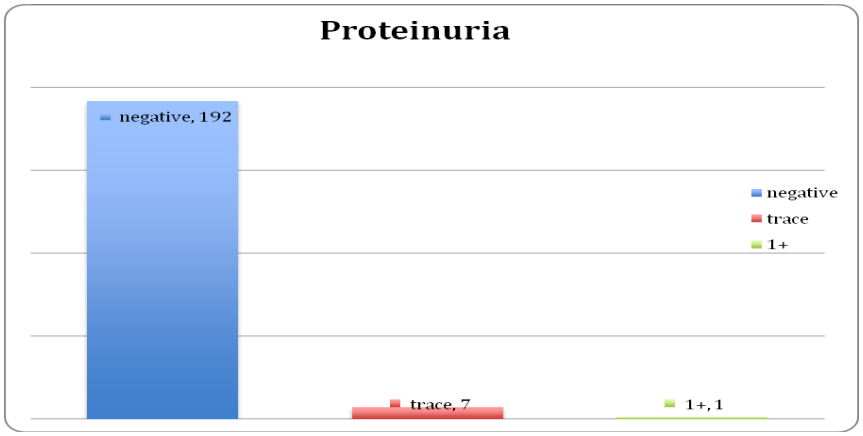
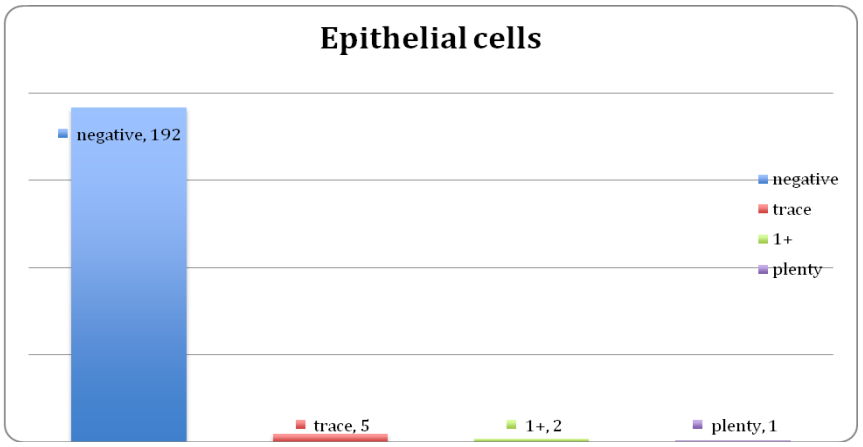


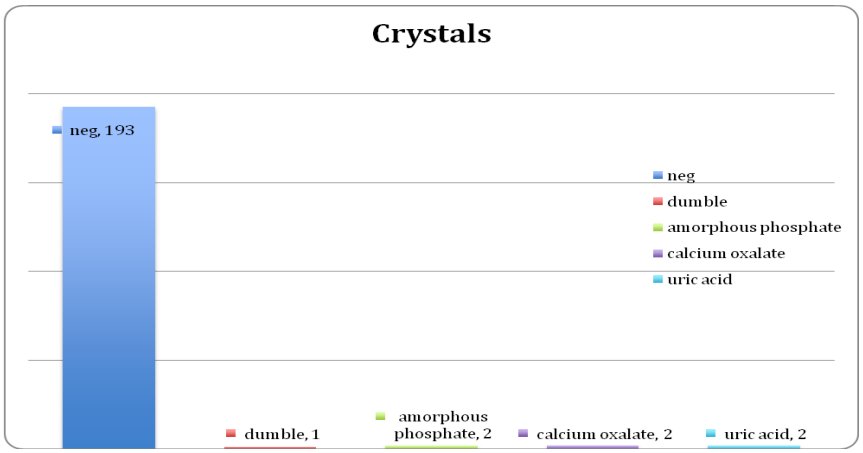
Figure 13: Graphical representation of proteinuria in urine of the students taken in our study.

In the above bar graph, 192 students shows negative protein value while the 8 out of 200 students had positive protein value in their urine samples (trace=7 and '1+'=1)



Graph 14: Graphical representation of presence epithelial cells in the urine of students enrolled in our study.

Above graph represents that one student had plenty of epithelial cells in the urine, two had (1+) and five had trace amount of epithelial cells.



Graph 15: Graphical representation of different types of crystals found in the urine samples of the students in our study.

The above bar graph shows that various types of crystals were seen in 9 students.

Table 2: Table showing the Cross tab between the gender and WBCs of the students in our study(Sex* WBCs).

Crosstab table of Sex* WBCs						
Count		WBCs			Total	
		negative	trace	1+	plenty	
Sex	male	92	1	0	0	93
	female	95	8	3	1	107
Total		187	9	3	1	200

P value=0.036 (p<0.05).

Above cross tab table represents that there is significant difference in occurrence of leukocyturia between the male and female whose 'p' value was found to be 0.036 by applying the Pearson Chi-Square test ('P'< 0.05).

Table 3: Table showing the cross tab between the sex of the subjects and RBCs in our study (sex* RBC s)

Crosstab of Sex*RBCs						
Count		RBCs				Total
		negative	trace	1+	2+	
Sex	male	91	1	1	0	93
	female	93	10	3	1	107
Total		184	11	4	1	200

'p'value 0.038('p'<0.05)

The above cross tab table shows that on the basis of gender, there is significant difference in the occurrence of hematuria with the 'p' value 0.038 which is less than 0.05(p<0.05).The 'p' was determined by using the Pearson chi-square test.

Table 4: Table consists of the cross tab results between the sex and the bacteriuria of the students in our study.

Crosstab table of Sex* bacteriuria				
Count		Bacteriuria		Total
		bacteria	not seen	
Sex	male	2	91	93
	female	12	95	107
Total		14	186	200

P value 0.012('p'<0.05)

Here, the above cross tab table clearly shows that on the basis of gender there is significant difference in the occurrence of bacteriuria with the 'p' value 0.012 i.e., 'p'<0.05. Person chi- square test was the test of choice.

DISCUSSION

Our cross sectional study includes 200 urine samples from the students of two local schools of Dharan Municipality, Nepal from June to August 2013 AD. The age of the students in our study was confined below 10 years. Here, in our study the numbers of the female students were 107(54%) while those of the male students were 93(46%). The mean age of the students was 7.99±1.260 with median 8.00. Hajar F et al, in 2010 from, Lebanon, carried a cross sectional study in seven nurseries and primary schools in different regions of Lebanon. Eight hundred seventy asymptomatic children were enrolled in this study, of which twenty five (2.9%) children had urinary abnormalities, 1.5% had hematuria and nitrituria was seen in 0.45%.With respect to sex -urinary abnormalities were most commonly seen in females than males with the p value 0.021. [1]

Among the various pH value measured, the highest value was found to be 6.0(47%). Hence, our study showed that the normal urinary pH is acidic which is due to renal mechanism for regulation of pH. The H^+ ions generated in the normal circumstances are eliminated by acidified urine. The titratable acid such as sodium dihydrogen phosphate (NaH_2PO_4) and major urine acid i.e., ammonium ions (NH_4^+) are also eliminated by the kidney in the urine which gives the acidic pH of urine. In the same way the highest percentage of the specific gravity found in our study was 1.015(40%). Specific gravity gives an indication of the density of the urine that depends on the concentration of the dissolved total solids. It is basically helpful to estimate the hydration/dehydration of an individual or as an indicator of the concentrating ability of the kidney. The color of the urine in our study was mostly found to be yellow (89.5%) which is the general or normal color of urine. Yellow color is generally due to the pigment called urochrome (derivatives of urobilin, the end product of bilirubin). Similarly, the ketone bodies were seen in only 1 student while the bilirubin was seen in 2 students. Hematuria, leukocyturia, bacteriuria, and nitrituria was found in the most of students of our study which are followed by the proteinuria and presence of epithelial cells and some crystals.

The percentage of hematuria in our study was found to be 6.5 % which is

similar with the study of Oviasu et al [2] Nigeria, Parakh Prince et al BPKIHS, Dharan [3] i.e., 5.25% and 5.5%(first screening) respectively. This value is more than the value of study done by Hajar F et al [1] in 2010, Lebanon and Murakami M et al [4] in 1986, Tokyo Japan which shows 1.5% and 0.54% hematuria respectively. Along with our study, the study done by the Hajar F et al. [1] Lebanon, Murakami M et al, [4] Tokyo Japan, Lin CY et al, [5] Taipei and Oviasu E et al [2] Nigeria shows that the prevalence of the hematuria was higher in the female than the male with the p value less the 0.05($p<0.05$). The hematuria may result simply from the exercise or menstrual blood contamination. However, it may also be indicative of trauma, particularly vascular injury, renal/calculi obstruction, pyelonephritis, or cystitis.

Similarly, the prevalence of proteinuria in our study was found to be 4% which is almost equal to the outcome of Shajari et al [6] (proteinuria=3.6%) and also of Oviasu E et al [2] i.e, proteinuria=4.7%. But the results given by Murakami et al [2] and Hajar F et al [1] do not accordance with our result. Also our results convey that there is no significant difference in the occurrence of proteinuria on the basis of gender with the 'p' value=0.399($p>0.050$) which is just opposite of the study done by the Lin CY et al, [5] Taipei. Generally, the albumin is most sensitive protein to the urine strips. Also the false positive result occurs in specimens that are alkaline and highly buffered.

Among 200 students, only 1(0.5%) had ketonuria, two (1%) students shows the bilirubin in their urine and glycosuria was seen in 1.5% students with trace amount in two students and 1+ amount in one students which shows a little similarity with the results of Park YH et al. [7] There is no persistence of gender wise difference in the above parameters with the 'p' value more than 0.05.

The prevalence of nitrituria and bacteriuria in our study was found to be 6.5% and 7%. The prevalence of bacteriuria in female was found to be more than the male with the significant 'p' value 0.012 ($p<0.05$) which is also significant in the study of Antwi S et al, [8] Ghana with 'p' value of 0.018. The value of nitrituria is more than that of Hajar F et al [1] and Shajari et al. [6] Normally, urine is sterile and the presence of high amount of gram negative bacteria reduces the nitrate to nitrite which is detected by urine strips. The epithelial cells were seen higher in about 4% of the students which may be due to tubular injury, sloughing off the lining of the nephrons and urinary tract and heavily contaminated vaginal discharge in the urine. Out of 200 urine samples, only 7 students showed crystals in urine among which the calcium oxalate was detected in 2 individuals. The presence of the crystals may be due to renal calculi, acidic pH and alkaline pH. Likewise, in the study carried by Shajari et al, [6] Department of Nephrology, Shahid Sadogi Hospital, Iran, the most common findings were proteinuria (3.6%), hematuria (1%), leukocyturia (0.1%) and glycosuria (0.2%).

In our study, on the basis of sex, there is significant difference in the occurrence of hematuria, leukocyturia, bacteriuria and the changes in colors with the 'p' value less than 0.05('p'<0.05) which shows similarity with study accomplished by Hajar F et al [1] of Lebanon, Lin CY et al [5] of Taipei, Antwi S et al [8] of Ghana and Oviasu et al [9] of Nigeria. So, over all the prevalence of the urine abnormalities was found to be more in the female population than the male population with the significant 'p' value less than 0.05 ('p'<0.05) [1,5,6,9]

CONCLUSION

The study has indicated that screening program is useful for the early detection of the renal diseases or disorderness along with the urinary tract infection. Appearance of the positive results in various parameters like leukocyturia, hematuria, proteinuria, glycosuria, bilirubinuria, bacteriuria etc was seen in the urine samples of the students enrolled in our study which may be the indication of

infection in the kidney or urinary tract or any other causes. The delivery of the report and counseling them for further preventive measures to improve the condition has been useful.

Our study observed that on the basis of gender there is significant difference on the occurrence of leukocyturia, hematuria and bacteriuria with 'p' less than 0.05.Normally, females was found to be more infected than males. Such screening programs could have a long-term impact in reducing the burden of end stage renal disease in children.

LIMITATIONS

Students below 10 years of age were only selected for the study.

FURTHER SCOPE

Since, our study is the mass screening program hence, we can get the better result by increasing the sample size with increase in the number of schools. Not only in Dharan, this cross sectional study can be carried out in many other municipalities of Nepal, which will be very effective and helpful in the early diagnosis of the renal diseases and urinary tract infection of the children of Nepal.

Since, the candidates of our study were below 10 years old, they can be counseled for their further improvement of the health and giving the merits of drinking water a lot .The students with the urinary abnormalities can be suggested to consult with the physicians and come for the follow up of medical check up to reduce the burden of end stage renal diseases in the near future.

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