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Original Article

Prevalence of kidney related abnormalities among students

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Summary

Introduction: Chronic kidney disease (CKD) is characterized by progressive and irreversible deterioration of renal function, leading to permanent damage to the kidneys and eventual advancement to end-stage renal disease (ESRD). This study aims to conduct a screening program targeting kidney ailments among student populations residing in the Laleh region of Tabriz during the year 2019.

Methods: The current investigation employed a descriptive-analytical cross-sectional methodology. It concentrated on school-age children domiciled in Tabriz throughout the calendar year of 2019. As part of the screening protocol, a cohort of 523 students spanning from the initial year of primary school to the inaugural year of high school (aged 7 to 16 years) who availed themselves at the Razi Health Center in 2019 were selected for analysis utilizing convenience sampling techniques. The principal aim was to ascertain individuals with potential susceptibility to renal failure. Blood pressure assessment and urinalysis were the screening modalities utilized in this inquiry.

Findings: In this investigation, the study cohort exhibited a mean age of 11.63 years, with a standard deviation of 2.9 years. Female participants constituted the majority, comprising 287 individuals (54.9%). A history of kidney disease was documented in 10 cases (1.9%), while high blood pressure was reported in only 1 case (0.2%). Family history unveiled kidney disease in 58 cases (11.1%) and high blood pressure in 116 cases (22.2%). The prevalence of urobilinogen, ketonuria, and glucosuria was observed in 13 cases (2.5%), 4 cases (0.8%), and 5 cases (0.1%), respectively. Bilirubinuria and nitrituria were detected in 19 cases (3.6%) and 9 cases (1.7%), respectively. Proteinuria was prevalent in 80 cases (15.3%). The mean urine pH was 6.52 (±0.8), with 65 cases (12.4%) displaying a pH below 7 and 10 cases (1.9%) above 7. The median urine specific gravity was 1.03 (interquartile range: 1.02 - 1.03). Mild, moderate, and severe hematuria were identified in 51 cases (9.8%), 11 cases (2.1%), and 7 cases (1.3%), in the same order. Females exhibited significantly higher levels of pyuria ($P<0.001$) and hematuria ($P=0.020$) compared to males. Nonetheless, no statistically significant gender disparities were noted in other urinary parameters among the study subjects ($P>0.05$).

Conclusion: Proteinuria appears to manifest in around 3.4% of children of school age. Furthermore, the incidence of urobilinogen, ketonuria, and glucosuria, alongside bilirubinuria and nitrituria, among this demographic cohort, appears to be below 4%.

Keywords: Screening, Kidney disease, Proteinuria

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Introduction

Chronic Kidney Disease (CKD) represents a spectrum of conditions marked by persistent and irreversible damage to the kidneys, resulting in a gradual decline in renal function. Ultimately, this decline leads to the advanced stage of kidney impairment.[1] The etiology of CKD differs substantially between pediatric and adult populations. Major contributing factors in children encompass congenital anomalies impacting the urinary system and kidney, genetic renal disorders, glomerulonephritis, obstructive nephropathy, dysplastic kidney, polycystic kidney disease, and glomerulosclerosis.[2,3]

According to the guidelines outlined by the Kidney Disease Improving Global Outcomes (KDIGO), end-stage renal disease (ESRD) denotes the terminal phase of CKD, characterized by an estimated glomerular filtration rate (eGFR) below 15 ml/min and kidney function diminished to less than 10% of its normal capacity, resulting in inadequate renal function.[4] CKDs present with a progressive decline in renal function, ultimately culminating in end-stage kidney disease typically within a timeframe of 10 to 20 years following the onset of the disease. Globally, an estimated 5 to 24 million individuals succumb to kidney disease annually, reflecting a rising prevalence of CKD worldwide. Projections for Iran suggest that the population of those with end-stage CKD is expected to reach around 52 000 by the end of the year, with an average growth rate ranging from 0 to 5%.[5] The prevalence of CKD in children and adolescents is between 15 and 74.7 cases per 1 million children. The burden of CKD in children and adolescents has increased globally, especially in countries with a lower socioeconomic development index.[6]

The etiology of CKD in adolescents differs from that in

adults. In younger populations, congenital and hereditary conditions like congenital anomalies of the kidney and urinary tract (CAKUT), glomerular diseases, and genetic disorders (e.g., polycystic kidney disease) are the leading causes. In contrast, in adults, lifestyle-related factors such as hypertension, diabetes, urinary tract obstruction from kidney stones, benign prostatic hyperplasia, certain malignancies, glomerulonephritis, vesicoureteral reflux, polycystic kidney disease, nephrotic syndrome, and autoimmune disorders such as lupus and obesity are primary drivers. However, the increase in lifestyle-related conditions in adolescents has led to a growing prevalence of CKD linked to obesity and metabolic syndrome, further complicating the etiology in this age group. The progression of CKD in adolescents is also affected by genetic predisposition, inflammatory disorders, and environmental influences.[5]

In instances where kidney disease progresses to renal failure, patients may require replacement therapies such as dialysis and transplantation, which can exert significant financial burdens on both the individual and the healthcare infrastructure. Furthermore, numerous research investigations have demonstrated that post-transplantation medications, including calcineurin inhibitors, may carry substantial adverse effects, including liver and kidney toxicity, neurological issues, dyslipidemia, hypertension, and the onset of new diabetes following transplantation. These adverse medication effects contribute to organ dysfunction, presenting persistent challenges for transplant recipients.[7]

Countries like Japan, Taiwan, and South Korea have established systematic annual screening programs to detect kidney disorders. An examination of data spanning from 1984 to 2002 reveals a decline in the progression of individuals to the terminal stage of kidney disease. However, the extent to which this reduction can be solely attributed to timely screening remains uncertain, as other factors may also be influencing this trend.[5]

The study by Amanullah et al included 229 children diagnosed with CKD, with a median diagnosis age of 10 years and a male-to-female ratio of 1.8:1 showed only 5% of the children were in stage 1 CKD. The primary cause was CAKUT, affecting 49% of the participants. Outcomes were poorer for children with glomerular disease. Proteinuria, hypertension, anemia, and bone disease were linked to increased rates of morbidity and mortality.[6]

Given the significance of kidney disease screening emphasized previously and the paucity of existing research,[8] our investigation endeavors to assess kidney disease prevalence among school-aged children in their immediate community. The primary objective of this research is to establish a foundational comprehension of kidney disease prevalence in children within this demographic, with a specific focus on the urban setting of Tabriz.

Methods

Study design and setting

This descriptive-analytical cross-sectional investigation was conducted at the Razi Health Center, a prominent healthcare institution located in the western sector of Tabriz city, Laleh, for a period of twelve months, commencing from April 2019 to March 2020.

Study population

The study encompassed a cohort of 523 asymptomatic students. Inclusion criteria involved students from first grade of elementary school to first grade of high school (ages 7 to 17 years) within the time frame from April 2023 to March 2024 with parental consent. Exclusion criteria involved the presence of underlying ailments such as infiltrative disorders, neoplasms, and metabolic dysfunctions, as well as participant or parental dissatisfaction.

Study protocol

A cohort of 523 eligible individuals underwent evaluation at the Razi Health Center, where those identified as being at risk of kidney dysfunction were targeted for therapeutic intervention aimed at arresting or ameliorating disease progression. Simultaneously, the participants received guidance at the social medical prevention division of Tabriz University of Medical Sciences, where they received education regarding kidney diseases and associated risk factors. The screening tools included blood pressure measurement and dipstick testing. Blood pressure was measured twice for each child, on both the right and left arms, and recorded.

Urine samples collected were tested with dipsticks using pre-prepared kits to qualitatively assess levels of protein, glucose, urobilinogen, bilirubin, nitrate, blood, ketones, leukocytes, and specific gravity. Additionally, a family history was collected, including information on hypertension, kidney disease, and a family history of proteinuria. This data was recorded in a checklist, and the raw information was subsequently subjected to statistical analysis.

Sample size

The sample size was established at $n = 523$ using convenient accessible sampling methods while adhering to a significance level (α) of 5% and an error coefficient of 0.1. Additionally, a P-value below 0.05 was deemed statistically significant.

Statistical analysis

Data analysis was performed using SPSS version 26. The Kolmogorov–Smirnov test was initially employed to assess the normal distribution of the data. Means were reported for normally distributed quantitative data, while medians (percentiles 25 and 75) were reported for non-

normally distributed quantitative data. Fisher's exact and Chi-square tests were utilized for qualitative data analysis, whereas the Mann–Whitney test was applied for analyzing non-normally distributed quantitative data.

Results

As delineated previously, a survey encompassing 523 participants of school age was administered, where screening procedures including urine analysis and blood pressure assessment were conducted at healthcare centers. The mean age of the participants, presented as mean (standard deviation), was 11.63 (±2.9) years. The predominant gender among the participants was female, constituting 287 individuals (54.9%). A history of kidney disease was reported in ten cases (1.9%), while one case (0.2%) had a medical history of hypertension. Familial history ascertained during the study revealed that 58 cases (11.1%) had a familial predisposition to kidney disease, and 116 cases (22.2%) had a familial predisposition to hypertension. Also, the average (standard deviation) systolic blood pressure for the left and right hands was 109/86 (±44/3) and 110/92 (±49/3), respectively. Similarly, the average (standard deviation) diastolic blood pressure for the left and right hands was 65/54 (±9/8) and 65/43 (±10/8), respectively (Table 1).

Table 2 presents the prevalence of abnormal urine analysis findings among the participants. The incidence of proteinuria in this cohort is 18 cases (3.4%). The prevalence of urobilinogenuria, ketonuria, and glucosuria is 13 (2.5%), 4 (0.8%), and 5 (1.0%), respectively. Additionally, the prevalence of bilirubinuria and nitrituria is 19 (3.6%) and 9 (1.7%). The mean urine pH is 6.52 (±0.8%), with 65 cases (12.4%) exhibiting a urine pH less than 7 and 10 cases (1.9%) with a urine pH greater than 7. The median (first and third quartile) of urine specific gravity is 1.03 (1.02-1.03). Furthermore, the prevalence of pyuria in this cohort is 33 cases (6.3%). Mild, moderate, and severe hematuria are observed in 51 cases (9.8%), 11 cases (2.1%), and 7 cases (1.0%), respectively.

Table 1. Demographic features of participants

Variables	Amounts
Gender	
Male	235 (±45.1)
Female	287 (±54.9)
Age (y)	11.63 (±2.9)
Kidney disease history	10 (±1.9)
Familial history of kidney disease	58 (±11.1)
Hypertension history	1 (±0.2)
Familial history of hypertension	116 (±22.2)
Right hand systolic pressure	110.92 (±49.3)
Right hand diastolic pressure	65.43 (±10.8)
Left hand systolic pressure	109.86 (±44.3)
Left hand diastolic pressure	65.54 (±9.8)

Table 3 presents the correlation between gender and abnormal findings in the participants' urine analyses. Among all parameters, only pyuria and hematuria exhibit a significant association with gender. Both pyuria and hematuria are notably more prevalent in females compared to males, with a significant *P* value for pyuria (<0.001) and hematuria (0.020); however, no significant association is observed between gender and other parameters.

Discussion

This study, conducted in 2019 within the Laleh region of Tabriz, focused on examining kidney diseases among students. The prevalence of proteinuria among study participants was 15.3%, with 18 cases identified. In a separate investigation by Banerjee et al in 2022, renal abnormalities among 1675 asymptomatic Indian children aged 5 to 19 years were evaluated, revealing prevalence rates of isolated hematuria, isolated proteinuria, and glycosuria at 1.9%, 0.35%, and 0.06%, respectively.[9] In a recent study involving 292 children at the age of 7, it was observed that 31 children (10.61%) exhibited urinary tract issues. Among them, a majority of 163 children (55.82%) were diagnosed with urinary problems associated with crystalluria. Furthermore, within a subgroup of children, multiple urinary tract ailments were present, with pyuria affecting 13 children (8.7%) as the predominant condition, and proteinuria emerging as the least prevalent issue.[10] In a cross-sectional examination involving 1000 children aged between 6 to 12 years, conducted to ascertain the prevalence of urinary irregularities using a dipstick test, the findings revealed the following occurrences: urinary tract infection at a rate of 1.8%, glucosuria at 0.1%, and

Table 2. Prevalence of abnormal items in urine analysis of participants

Variables	Amounts
Urobilinogen	13 (2.5)
Ketonuria	4 (0.8)
Glucosuria	5 (1.0)
Bilirubinuria	19 (3.6)
Proteinuria	80 (15.3)
Nitrituria	9 (1.7)
Pyuria	33 (6.3)
Hematuria	
Mild	51 (9.8)
Moderate	11 (2.1)
Severe	7 (1.3)
Urine pH	
7	448 (85.7)
<7	65 (12.4)
>7	10 (1.9)
Mean (SD)	6.52 (±0.8)
Urine viscosity	1.03 (1.02-1.03)

Table 3. Association between sex and urine analysis abnormalities

Variables	Male	Female	*P* value
Urobilinogen	4 (1.7)	9 (3.1)	0.296
Ketonuria	2 (0.9)	2 (0.7)	1.000
Glucosuria	3 (1.3)	2 (0.7)	0.662
Bilirubinuria	10 (4.3)	9 (3.1)	0.491
Proteinuria	33 (14.0)	47 (16.4)	0.461
Nitrituria	7 (3.0)	2 (0.7)	0.086
Pyuria	0 (0.0)	33 (11.5)	<0.001*
Hematuria			
Mild	20 (8.5)	31 (10.8)	0.020*
Moderate	1 (0.4)	10 (3.5)	
Severe	1 (0.4)	6 (2.1)	
Urine pH			
7	204 (86.8)	243 (84.7)	0.623
<7	28 (11.9)	37 (12.9)	
>7	3 (1.3)	7 (2.4)	
Urine viscosity	1.03 (1.03-1.03)	1.03 (1.03-1.03)	0.076

Fisher's exact and Chi-square tests were utilized for qualitative data analysis, Mann–Whitney test was applied for analyzing non-normally distributed quantitative data.
*$P<0.05$ statistically significant.

combined hematuria and proteinuria at 0.1%. Isolated hematuria was observed in 0.9% of cases, while isolated proteinuria was detected in 0.4% of cases. Microscopic analysis of urine disclosed the presence of crystals in 0.8% of cases. Additionally, abnormal renal sonography results were documented in five cases, while eight cases exhibited positive urine culture outcomes.[11] In a cross-sectional study carried out in the southwestern region of Iran, specifically in the provinces of Kohgiluyeh and Boyer-Ahmad, encompassing a rural population exceeding 800 individuals in 2019, a sample of 676 people aged between 3 to 95 years was included. Among this cohort, consisting of 350 women and 326 men, it was observed that 72 individuals (10.6% of the total population) exhibited mild proteinuria or higher as detected by dipstick testing. Furthermore, within this group, 42 patients (6.2%) demonstrated a protein excretion ratio exceeding 150 mg/g or surpassing 150 mg of excreted protein per day.[12]

In the research conducted by Suthar et al, urine tests were administered to Indian children ranging from 5 to 25 years of age. The participants were divided into two groups: Group 1 comprised children aged 5 to 10 years, while group 2 consisted of children aged 10 to 15 years. The findings indicated that proteinuria was present in 4.59% of children in group 1 and mild proteinuria was observed in 1.2% of this group, whereas in group 2, 2.56% of children exhibited mild proteinuria. Notably, severe proteinuria was more prevalent in group 1, accounting for 0.77% compared to 0.06% in group 2.[8] In Sinha and colleagues' study, which involved 3340 students from seven schools within Ahmadabad city, it was discovered that 5.8% of the students exhibited abnormal findings in urine tests, with 2% of them manifesting proteinuria.[13] In a cross-sectional study involving 1169 students aged between 7 to 15 years, chosen through cluster random sampling from Zahedan city schools, morning urine samples were evaluated using urine test strips across two sessions. The detection of protein or blood in the urine was determined by observing any color change. Upon obtaining a positive outcome, the samples underwent microscopic examination in the laboratory. The findings indicated that the prevalence of proteinuria was 1.05% among girls and 0.33% among boys.[14] In Dalirani and colleagues' research, a total of 659 healthy children aged 6 to 12 years from Qazvin schools underwent examination utilizing a multistage cluster sampling approach. The urine test was conducted in two stages, initially qualitatively, and subsequently, after a six-month interval, employing a semi quantitative method in positive instances to evaluate proteinuria. The prevalence of proteinuria was determined to be 1.8%, with boys exhibiting a twice higher rate compared to girls.[15] In the research conducted by Ghasemi et al, a total of 2047 primary school children from both Bushehr city and Khark Island were chosen at random to investigate the prevalence of asymptomatic hematuria. Initially, urine test strips were utilized to detect the presence of blood or protein in the urine. Individuals with positive test outcomes were subjected to a reevaluation two weeks later using urine dipsticks, followed by microscopic examination of urine samples. The findings indicated that the prevalence of proteinuria in this study was 1.07%, which equated to 22 cases.[16]

Considering the findings regarding the prevalence of proteinuria among school-age children, the current investigation documented a notably elevated occurrence of this condition within this demographic in contrast to previous studies referenced. Various factors could contribute to this variance, encompassing distinctions in research settings and disparities in inclusion and exclusion criteria, such as disease severity and background variables. Further exploration is warranted to elucidate the etiology of proteinuria, potentially through genetic testing and kidney biopsies, given the ambiguous nature of the underlying mechanisms associated with this condition.

Additionally, within the scope of this study, glycosuria was observed in 1% of the study participants, totaling 5 cases. A separate study conducted by Safary et al explored abnormal urine test results among school-age children in Hamadan city. This study involved 800 fourth-grade students aged 10 to 11. Initially, their fresh urine samples underwent analysis using urine test strips. Those exhibiting abnormal urine findings underwent further assessment, including urinalysis and culture, and when deemed necessary, underwent ultrasound scans of the urinary system. The findings from Safary and colleagues' study indicated that glucosuria was identified in 0.1% of

the study participants, involving one female participant.[17] In the descriptive cross-sectional study conducted by Vazirian et al, a cluster random sampling method was employed to select participants from primary schools in Kermanshah. The study encompassed a total of 6831 cases. Urine samples were scrutinized for four parameters: hematuria, proteinuria, pyuria, and glucosuria. Abnormal cases underwent reexamination by a physician, and the findings were duly documented. The outcomes of this study indicated that the prevalence of glucosuria in boys and girls during the initial and subsequent screenings were as follows: 0.08% and 0.06%, 0.18% and 0.06%, and 0.13% and 0.06%, respectively.[18] In a separate investigation by Shajari et al, urine screening tests were administered randomly to 1601 students as part of a three-month follow-up initiative across four educational districts in Shiraz. The findings revealed that glucosuria was detected in three cases (0.2%) among the participants.[19] In the cross-sectional investigation conducted by El-Abden et al, involving 706 students (333 boys and 373 girls) from primary schools in the Western province of Egypt, random sampling was employed to select participants. All enrolled students underwent a comprehensive clinical examination, and urine samples were collected for analysis. The urine samples were scrutinized for protein, blood, glucose, nitrite, and leukocytes. Among these individuals, glycosuria was observed in one case, representing a prevalence of 0.14%.[20]

Considering the results regarding the prevalence of glucosuria among school-aged children, the current investigation documented a higher occurrence of glucosuria in this demographic compared to the studies cited. Discrepancies in findings could be attributed to differences in the target population, research setting, sample size, and criteria for inclusion and exclusion from the study, including disease type and severity, as well as background factors. These variations may account for the differences observed between our study and the previously mentioned studies.

Conclusion

Proteinuria appears to manifest in around 15.3% of children of school age. Furthermore, the incidence of urobilinogen, ketonuria, and glucosuria, alongside bilirubinuria and nitrituria, among this demographic cohort, appears to be below 4%.

Acknowledgments

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Authors' Contribution

Conceptualization: Zhila Khamnian, Hamid Tayyebi Khosroshahi.
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Supervision: Hamid Tayyebi Khosroshahi.
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Competing Interests

No conflict of interest in this work

Ethical Approval

The study process was reviewed and approved by the ethics committee of Tabriz University of Medical Sciences, according to the declaration of Helsinki (ethics code: IR.TBZMED.REC.1401.840). Before collecting data, informed consent was obtained from all patients. All the methods were carried out according to relevant guidelines and regulations.

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References

1. Hogg RJ. Screening for CKD in children: a global controversy. Clin J Am Soc Nephrol. 2009;4(2):509-15. doi: 10.2215/cjn.01210308.
2. Harambat J, van Stralen KJ, Kim JJ, Tizard EJ. Epidemiology of chronic kidney disease in children. Pediatr Nephrol. 2012;27(3):363-73. doi: 10.1007/s00467-011-1939-1.
3. Gulati S, Langman CB. Chronic kidney disease in children. Department of Nephrology and Transplant Medicine; 2020.
4. de Boer IH, Caramori ML, Chan JC, Heerspink HJ, Hurst C, Khunti K, et al. KDIGO 2020 clinical practice guideline for diabetes management in chronic kidney disease. Kidney Int. 2020;98(4S):S1-115. doi: 10.1016/j.kint.2020.06.019.
5. Wang H, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F, et al. Global, regional, and national under-5 mortality, adult mortality, age-specific mortality, and life expectancy, 1970-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390(10100):1084-150. doi: 10.1016/s0140-6736(17)31833-0.
6. Amanullah F, Malik AA, Zaidi Z. Chronic kidney disease causes and outcomes in children: perspective from a LMIC setting. PLoS One. 2022;17(6):e0269632. doi: 10.1371/journal.pone.0269632.
7. Ko MS, Choi YH, Jung SH, Lee JS, Kim HS, Lee CH, et al. Tacrolimus therapy causes hepatotoxicity in patients with a history of liver disease. Int J Clin Pharmacol Ther. 2015;53(5):363-71. doi: 10.5414/cp202226.
8. Suthar KS, Vanikar AV, Nigam LA, Patel RD, Kanodia KV, Thakkar UG, et al. Urinary screening for early detection of kidney diseases. Indian J Pediatr. 2018;85(8):607-12. doi: 10.1007/s12098-017-2494-y.
9. Banerjee M, Roy D, Lingeswaran M, Tomo S, Mittal A, Varma PP. Urinary screening in asymptomatic Indian children: a cross sectional epidemiological study. EJIFCC. 2022;33(3):242-51.
10. Kamyab F, Gholami M, Shaghaghi F, Bidkhori M, Kamali Z. Urine analysis with dipstick test in asymptomatic 7-year-old children. J Educ Health Promot. 2020;9:3. doi: 10.4103/jehp.jehp_46_19.
11. Shalaby MA, Abd El-Hameed AE, Affifi WE, Abd El-Halim WA. Screening for urine abnormalities among school children in Qalubyia. GEGET. 2019;14(1):75-81. doi: 10.21608/geget.2019.38028.
12. Hassanzadeh S, Azarmehr N, Jahanshahi A, Malekzadeh JM, Doustimotlagh AH. Prevalence of proteinuria and hematuria in a rural population in the southwest of Iran. Saudi J Kidney Dis Transpl. 2022;33(Suppl):S241-7. doi: 10.4103/1319-

2442.384193.
13. Sinha A, Bagga A. Screening urinalysis in detection of chronic kidney disease in children. Indian J Pediatr. 2018;85(8):603-4. doi: 10.1007/s12098-018-2707-z.
14. Sadeghi Bojd S, Hadian MA, Rakhshani F. Prevalence of asymptomatic hematuria and proteinuria among school children in Zahedan. Zahedan J Res Med Sci. 2008;10(1):59-64. [Persian].
15. Dalirani R, Ghoreishi SK, Daneshi MM, Laghaie SH, Akhtari Baghan M, Heydarnezhad M. Prevalence of proteinuria among school children of Qazvin [2002]. J Qazvin Univ Med Sci. 2008;12(2):89-90. [Persian].
16. Ghasemi K, Beigi S, Shojaee M. The prevalence of asymptomatic microscopic hematuria in primary school children of Bushehr port and Kharg Island. Iran South Med J. 2004;7(1):54-60. [Persian].
17. Safary M, Darogheh Z, Derakhshan M, Nabavizadeh S. Abnormal urinary findings in school aged children in Hamedan. Med J Mashhad Univ Med Sci. 2005;48(87):17-22. [Persian].
18. Vazirian S, Golpaygani MR, Aminzadeh M, Moshiri SA, Mohammad Nejad M. Evaluation of urinalysis results in asymptomatic primary school children in Kermanshah city (2003). J Kermanshah Univ Med Sci. 2004;8(1):43-50. [Persian].
19. Shajari A, Fallah-Zadeh MH, Shajari H. Screening of renal diseases in the first primary school children in Shiraz. Acta Med Iran. 2007;45(3):215-8.
20. El-Abden MY, Abo-Elkheir OI, El-Sadek SM, Awaad MA, El-Said AM. Screening of renal diseases by urine analysis in primary school aged children at El-Gharbiya governorate-Egypt. Egypt J Hosp Med. 2013;50(1):24-33. doi: 10.21608/ejhm.2013.16074.