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Assessment of Urea, Creatinine, Calcium and Magnesium among Drug Users Homeless –Khartoum

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Abstract

Background: *Homeless is worldwide problem, developed and under-developed countries are suffering from, rises leading to health problem, drugs and alcohol related , lack to engage and to medical care, so they develop chronic disorders and that rises morbidity and mortality..*

Objective: *The aim of this study to evaluate the levels of urea, creatinine, calcium, magnesium and urea/creatinine ratio in homeless individual ,and the effect of the drugs abuse on measured parameters..*

Materials and Methods: *50 drugs abuse homeless members were volunteer to assess urea, creatinine, urea /creatinine ratio, calcium and magnesium .In addition 50 healthy controls were involved. Parameters were measured by means of semi – automated chemical analyzer BTS 350, using Biosystem reagents, data obtained analyzed via statistical pakage of social version 22.*

Results: *The level of serum creatinine and urea was significantly increased in drugs abuse homeless group when compared with reference group (0.56±0.23 mg/dl versus 0.93±0.19) (P 0.5). Also the urea creatinine ratio was significantly higher in drugs abuse homeless group when compare with health control (49.9±29.15 mg/dl versus 24.56±8.77) (P = 0.000).The study illustrated significant decrease in the level of both calcium and magnesium in drugs abuse homeless group when compared with reference group (8.62±0.53mg/dl versus 9.53±0.67.mg/dl p= 0.000, 2.196±0.37mg/dl versus 1.97±0.40 mg/dl p= 0.005 respectively). Across the gender the study deduced significant difference in urea and creatinine levels (male 27.40 ±2.74 mg/dl female 21.11±2.49 mg/dl p =0.002, male 0.97±0.04 female 0.51±0.02mg/dl p= 0.027 respectively) where as there is insignificant difference in calcium and magnesium levels ($p \geq 0.05$) in the drugs abuse homless group. Furthermore the levels of creatine and urea were significantly positively correlated with duration of drugs abuse homless ($p<0.05$), where as calcium and magnesium levels were significantly inversely correlated with duration of drugs abuse homless in the study group($p< 0.05$). Across the gender urea and creatinine were significantly differ ($p < 0.05$) where as there is insignificant difference in calcium and magnesium levels ($p > 0.05$) in the drugs abuse homless group.*

Conclusion: *Substances abuse by homeless significantly impairs the renal function and decreased calcium and magnesium levels, so they should be considered as risk factors for kidney injury and osteoporosis among homeless.*

Keywords: *Drugs Abuse homeless, Urea, Creatinine, calcium. Magnesium. Urea Creatinine Rati.*

Introduction

Homelessness is about more than rooflessness. A home is more than a physical space: it provides roots, identity, security, and a sense of belonging and a place of emotional well being[(1)]. It is a broad definition with four categories that span more to less acute homelessness experiences. They are: rooflessness, houselessness, insecure housing and inadequate housing. The definition has been successful in drawing attention to the breadth of homeless experiences[(2)]. Homelessness affects men and women, young and old, singles and families. Homelessness can be for a short term, usually after a crisis, to long term and exist over a life[(3)]. Being homeless is linked with shorter life expectancy, as enormous health inequalities are found amongst homelessness[(4)] they are less likely to access primary and preventive health services[(5)] causing increased risk for later-stage diagnosis of disease[(6)], poor control of manageable conditions (e.g., hypertension, diabetes) and hospitalization for preventable conditions[(7)].

Not all people who have a drug and or alcohol problem are homeless but for those homeless people who have a drug misuse the challenges for service providers to engage and assist with treatment are made extremely difficult [(8)].Drug misuse is both a precipitating factor and a consequence of homelessness. The prevalence estimates of drug misuse among homeless people are 20—35%; and 10—20% have an additional mental health diagnosis[(9)]. Because of structural and personal barriers that complicate access to health service less than one quarter of homeless people in the USA, who need treatment, actually receive it [(9)]. Research has found that homeless people are 7.5 times more likely to excessively use heroin compared to the general population, and within the older homeless population, 25% have major issues related to alcohol use[(8)]. Chronic diseases in homeless people are seen as a direct result of poor housing conditions, poor nutrition and stressful living conditions[(10)]. Homeless people are also subjected to many barriers preventing access to effective primary care [(11)]

Urea: is the end product of protein catabolism in mammals. Is made predominantly in the liver from ammonia and bicarbonate, cleaned by the kidney, and is used as part of the renal functions tests[(12)]. Creatinine is best indicator of the renal injury. The amount of creatinine produced by the body each day depends on the person's muscle mass: a young, muscular man produces more creatinine than a petite, older woman. Because muscle mass normally changes very little, creatinine is usually produced at constant rate every day in each person. Failure to consider variations in creatinine production due to differences in muscle mass between individuals may lead to misinterpretation of serum creatinine levels. For example, a serum creatinine value in the reference range in a young, healthy person reflects a very different GFR value than an identical serum creatinine value in a much older person. Even though elevated serum creatinine commonly represents renal pathology, a low serum creatinine in certain muscle-wasting conditions, malnutrition, and amputation does not exclude an underlying renal dysfunction[(13).]

Homeless population is mostly suffer from nutritional deficiency including vitamins and mineral, Calcium is the most abundant stored nutrient in the human body. More than 99% is stored in the bones and teeth. Less than 1% is found in extracellular serum calcium.[(14-15-16)] ,this extracellular pool maintains the plasma calcium level in tight control at a constant serum level, but it is not an accurate indicator of calcium stores in the body[(14,16)]. Magnesium Is the second most abundant intracellular cation and the fourth most abundant cation in the body. Magnesium plays an essential physiological role inmany functions of the body[(17)], this role is achieved through two important properties of magnesium; the ability to form chelates with important intracellular anionic-ligands, especially ATP, and its ability to compete with calcium for binding sites on proteins and membranes[(18)]. Magnesium is essential for the

synthesis of nucleic acids and proteins, for intermediary metabolism and for specific actions in different organs such as the neuromuscular and cardiovascular systems. Over 300 enzymes are dependent on magnesium[18].

The aim of the present work was to evaluate renal functions and calcium and magnesium level among drugs abuse homeless in Sudan, using serum urea and creatinine as serologic markers for kidney dysfunction, the urea/ creatinine ratio as indicators for kidney injury. Calcium and magnesium as indicator of the nutritional status among homeless Sudanese population in Khartoum.

Materials and Methods

This case control study conducted among homeless population campus in Khartoum state-Sudan. 50 individuals were volunteered to enroll and to be –subjected to medical care. 50 Healthy and community residents were selected to set as control group. Under hygienic conditions blood samples were collected in heparinized blood containers, plasma later separated and preserved frozen till time of measurement of parameters (urea, creatinine, calcium and magnesium), chemical analysis performed at Aljaily Khalid Musa medical laboratory center-Omdurman, by means of BTS350 analyzer (Biosystem trademark) and reagents were also provided by the same brand. Data obtained were analyzed with statistical package of social science (SPSS) program version 21. Chemical parameters were measured for case and control groups, independent T-test performed for both groups to compare in between, urea, creatinine, calcium, magnesium and ratio of urea/creatinine and the correlation coefficient between measured variable is significant at $p \leq 0.05$.

Results

100 individuals were involved in this study, 50 (50.0%) of them who considered by definition homeless (case group), were enrolled in this study, age's means±SD 32.48±15.11 years and they have 14.38±7.82 years as homeless. 50 individuals were home residents as control group. Homeless were 35 (70%) females and 15 (30%) males as in figure 1.

The level of serum creatinine and urea was significantly increased in drugs abuse homeless group when compared with reference group (1.05±0.02 mg/dl versus 0.81±0.03 mg/dl, P=0.000, 28.00± 2.01mg/dl versus 19.06 ±2.01 mg/dl, p= 0.03 respectively). Also the urea creatinine ratio was significantly higher in drugs abuse homeless group when compare with health control (26.67±2.15 mg/dl versus 23.4±1.77mg/dl, P = 0.05).The study demonstrated significant decrease in the level of both calcium and magnesium levels in drugs abuse homeless group when compared with reference group (8.62±0.53mg/dl versus 9.53±0.67.mg/dl p= 0.000, 2.196±0.37mg/dl versus 1.97±0.40 mg/dl p= 0.005 respectively) in table 1. Across the gender urea and creatinine were significantly differ (male 27.40 ±2.74 mg/dl female 21.11±2.49 mg/dl p =0.002, male 0.97±0.04 female 0.51±0.02mg/dl p= 0.027 respectively) where as there is insignificant difference in calcium and magnesium levels($p \geq 0.05$) in the drugs abuse homless group in table 2. Furthermore the levels of creatine and urea were significantly positively correlated with duration of drugs abuse homless (R=0.35, p=0.04,R=0.31,p= 0.05 respectively), where as calcium and magnesium levels were insignificantly inversely correlated with with duration of drugs abuse homless in the study group (R=-0.095 ,p= 0.53, R= -0.058,p= 0.68 respectively) in table 3.

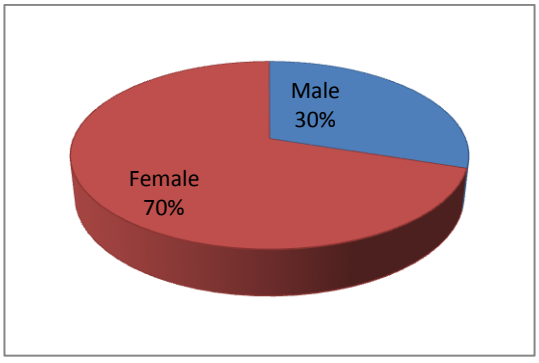

Figure (1) distribution of gender among case group

Table (1) mean concentration comparison of study parameters in case versus the control

Parameters	Case (Mean±SD)	Control(Mean±SD)	P-value
Urea	28.00±2.06	19.06±2.01	0.03
Creatinine	1.05±0.02	0.81±0.3	0.000
Calcium	8.62±0.53	9.53±0.67	0.000
Magnesium	2.196±0.37	1.97±0.40	0.005
Urea/Creatine	26.67±2.15	23.4±1.77	0.05

Table (2) mean concentration comparison of study parameters across the gender

Parameters	Male (Mean±SD)	Female (Mean±SD)	*P-value*
Urea	27.40±2.74	21.11±2.49	0.002
Creatinine	0.97±0.04	0.51±0.02	0.027
Calcium	9.15±1.41	8.39±1.56	0.113
Magnesium	2.28±0.31	2.16±0.40	0.260
Urea/Crea	48.42±25.33	50.56±44.08	0.830

Significant difference p value <0.05

Table 3: correlation between duration of drugs abuse homeless with the study's parameters in the test group

Duration/parameters	R value	P value
Urea	0.35	0.04
Creatinine	0.31	0.05
Ca	-0.095	0.51
Mg	-0.058	0.68
Urea/creatinine	0.131	0.366

Table 4: correlation between homeless age and study's parameters

Age	R value	P value
Urea	0.193	0.179
Creatinine	0.074	0.612
Ca	-0.100	0.491
Mg	-0.032	0.82
Urea/creatinine	0.136	0.348

Discussion

Homeless lack a fixed, regular and adequate right time residence .Researches indicate that drugs abuse is more common among homeless than with general population. Chronic drugs abuse homeless is associated with various body complications including nutritional and kidney injury[.8,17,18)]

In the current study the level of serum creatinine and urea was significantly increased in drugs abuse homeless group when compared with reference group. This finding is consistent with study by Ekramy et al (2016)[(19)] whom deduced that substance abuse causes significant impairment of the kidney function. Mansoor et al (2017)[(20)] performed systematic review of publications on nephrotoxicity of drugs of abuse and concluded that a wide range of renal manifestations were found to be associated with drug abuse. If the trend of increasing use of illicit drug use continues, it will put a significant percentage of the population at an elevated risk for poor renal outcomes. Drugs abuse causes vasoconstriction which results from uptake inhibition of catecholamines, serotonin and dopamine and increased release of norepinephrine from the adrenal glands. This surge of catecholamines increases alpha adrenergic stimulation which causes vascular smooth muscles to constrict[20,21]. Elicits drugs up regulates vascular endothelin-1 receptors which causes decreased renal blood flow and GFR[22,23,24]. Sustained illicit drugs-induced vasoconstriction has devastating effects that lead to renal hypertension even without signs of systemic hypertension. This hypertensive state causes renal damage and leads to kidney failure [25, 26]. Drugs abuse may also cause platelet adhesion and microaggregates[27].

In the present study the urea creatinine ratio was significantly higher in drugs abuse homeless group when compare with health control .In accordance with Stark (1998)[(28)] whom observed that Renal dysfunction can be induced by either injury to the glomeruli or the tubules leading to a decrease in the normal glomerular filtration rates (GFR). This will be in parallel with increased serum levels of the blood markers as blood urea/ creatinine ratio. However, An extrarenal problem

produces serum urea/ creatinine ratio of greater than 25:1. 5. Renal failure (acute or chronic) produces a BUN to serum creatinine ratio of 10:1. 6. Renal failure and extrarenal problems can co-exist.

Our study demonstrated significant decrease in the level of both calcium and magnesium levels in drugs abuse homeless group when compared with reference group, which agree with Shrea et al (2017)[29] who conducted systemic review of literature on nutritional deficiencies in homeless persons and deduced homeless drink alcohol excessively may be deficient in vitamin C, thiamine, and other nutrients and this can lead to malnutrition and consequent medical problems .Homeless people have a pote2ntial risk of serious medical problems because of staying in unsheltered places, being easily a侏ected by bad weather conditions, and exposed to hungry, being inadequate in hygiene and self-care, being exposed to physical and moral trauma more frequently, and not bene蓿ting adequately from nutrition and medical services. Lukaski et al (2002)[30] performed a double blind crossover study and concluded that low magnesium and calcium diet causes depleted bone calcium and magnesium content. Myron Winick (1985)[31] reported that homeless diet have low calorie intake, nutritional imbalance and low calcium that causes osteoporosis and various health problem

In the current study across the gender urea and creatinine were significantly differ, where as there is insignificant difference in calcium and magnesium levels in the drugs abuse homless which is consistent with fact that creatinine value is sex dependent mainly on muscle mass[12,13] .Furthermore the levels of creatine and urea were significantly positively correlated with duration of drugs abuse homeless, where as calcium and magnesium levels were insignificantly inversely correlated with duration of drugs abuse homeless in the study group .Illicit drugs in homeless population surge toxic effects on renal tubule and glomeruli, chronic exposure exacerbate this problem, as consequence the kidney loss its functions resulting in elevated waste product (urea, creatinine), low calcium and magnesium levels[10,17,18.].

Conclusion and Recommendation

Homeless population may suffer from renal injury and osteoporosis, measured parameters did not reveal enough yet, so regular program should be set to cover health and social life.

Consent

As per international standard or university Standard, patient's written consent has been collected and preserved by the authors..

Ethical Approval

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

Competing Interests

Authors have declared that no competing interests exist.

Authors' contribution

This work was carried out in collaboration between all authors. Author HBAE designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AMA and SAA managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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