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Research Article

Studying of heart diseases prevalence, distribution and cofactors in Sudanese population

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ABSTRACT

Background: the following study aimed to reveals the heart diseases (HD) prevalence, distribution and co-factors in Sudanese population during June 2014-June 2015 and to answer the questions related to, in Sudan.
Methods: The data collected from different hospitals as gender, age, body mass index BMI, smoking habits, residential states, Pathologies, cardiothoracic ratio CCT, symptoms and breathing rate.
Results: showed that HD were predominant among male with 56% and peaked among 65-77 year old, most of sample were either obese or overweight representing 57% or 35% respectively. The common cofactors for HD were the socio-economic, smoking, hypertension and obesity which representing 90%, 75%, 60% and 57% respectively. The heart diseases HD incidence in Khartoum, Aljazeera, White Nile, Red Sea, and West of Sudan was 40%, 25%, 20%, 10% and 5% respectively. The common type of HD was Coronary Arteries, Valves, Myocardial infarction, and Congestive Heart Failure representing 45%, 17%, 23%, and 15% respectively. And signs were Hypertension, Diabetes mellitus, High Cholesterol, breathing rate, edema, palpitation with relative frequencies 9%, 11%, 6%, 12%, 8% and 10% respectively. Patients' cardiothoracic ratio CTR exceeding normal level (0.5), A significant relationship between CTR and Breathing rate (BR) (R^2 = 0.8) fits in CTR=0.02BR+0.2 as well between age and BR (R^2) fits in BR=0.21age + 12.84. And all patients had BR exceeding the adult normal range (12-20).
Conclusions: HD could be as endemic to increase mortality following the uneasy avoidable cofactors in the nearest future.

Keywords: Cardiac, Diseases, Prevalence, Distribution, Endemic

INTRODUCTION

Cardiovascular diseases CVD, have been increasing rapidly recently in Sudan, which is expected to changes in nutrition mode, life style, social stress, economic burden, utilization of industrial fertilization and chemicals for fruits ripeness. As in this realm; Yang et al,[1] stated that: changes in lifestyle and longer life expectancy have led to an increased burden of cardiovascular and other chronic diseases; in addition to other factors which have been reported by Bonow et al,[2] such as ageing of the population, dramatic increase in the rate of obesity, Type 2 diabetes and their related complications of hypertension, hyperlipidaemia and atherosclerotic vascular disease. And also He et al; and Isomaa et al,[3,4] demonstrated an association of metabolic syndrome with the development of cardiovascular disease (CVD) and more confirmation related to mortality rate increment was given by Lakka et al.[5] Based on these induction factors of CVD, the heart diseases in Sudan has

been noticed in increasing phenomena and case not be controlled it may became as an endemic disease among youth and middle age group.

The acquired heart diseases AHD represent broad spectrum of defects, which often result in right and/or left heart overload (pressure and/or volume) and, in turn this leads to an enlargement of one or more cardiac chambers i.e. cardiomegaly.[6,7] The enlargement of cardiac chambers (ventricles and atriums) could be assigned for number of pathological processes that affect cardiovascular function, for instance: the left ventricular hypertrophy, dilation and remodeling have been considered as markers and outcome assessment in acquired heart disease.[8,9] In same utilization, the right heart enlargement carries additional predictive value to that of left ventricular dilation in acquired heart failure[10,11] Enlargement of the left atrium is a risk factor for atrial fibrillation, stroke and death in patients with ischemic heart disease and heart failure.[12,13] As well the outcome of Fallot's tetralogy could be predicted based on left and right ventricular sizes and progressive right ventricular dilation has been employed as a criterion for the timing of pulmonary valve replacement in these patients.[14] And the Ventricular size and function are also a predictive outcome in patients with single ventricular physiology or a systemic right ventricle.[15] Other accepted methods to quantify heart diseases and carries prognostic information in acquired heart disease is the cardiothoracic ratio (CTR),[16] in addition to pneumonia severity index (PSI), respiratory rate.[17,18]

METHODS

As retrospective study consists of 250 patients of heart diseases (HD) have been collected from different hospitals (Khartoum Teaching Hospitals, Heart Center Hospital and Omdurman Teaching Hospital) archiving section and some from Package Archiving Computerized System PACS during June 2014 to June 2015. The variables of interest were the gender, age, BMI (weight in Kg/ (Height in meter)2), smoking habits, residential states, types of Pathology, cardiothoracic ratio CTR, the symptoms and breathing rate. The collected variables have been analyzed using statistical package for social science SPSS and the data have been shown in bars% and correlation.

RESULTS

The following results related to the HD distribution based on gender, age group, correlation with BMI, etiological co-factors, states of Sudan, pathologic cases, signs, breath rate and respiratory rate correlation with age, which being plotted in forms of bars and scattered plots correlation.

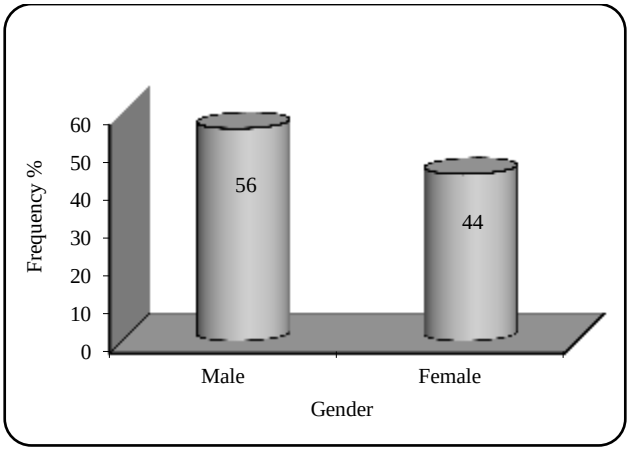

Figure 1: The incidence percent of heart diseases based on gender in Sudan 2015.

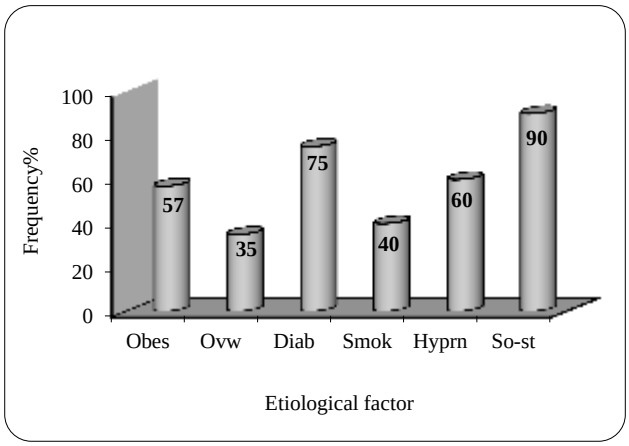

Figure 2: The common cofactor for cardiovascular diseases among Sudanese population during June 2014-June 2015.

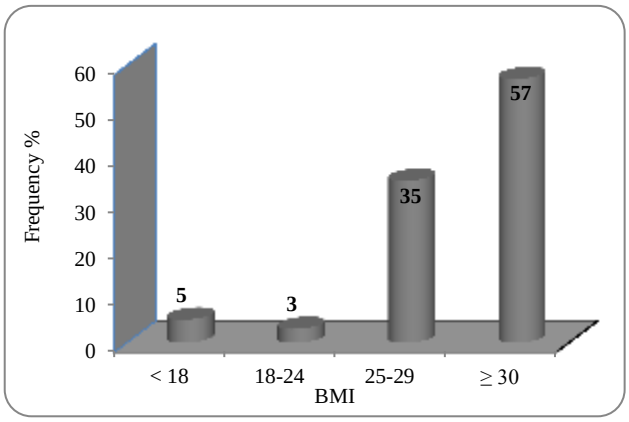

Figure 3: The body mass index BMI and the relevant frequency% among population during June 2014 – June 2015.

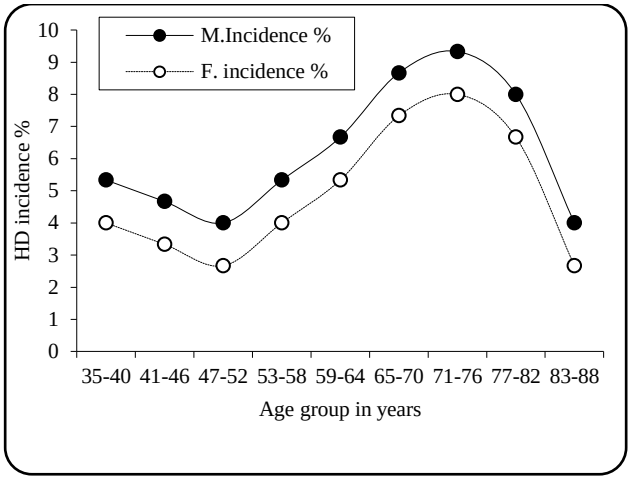

Figure 4: The heart diseases distribution in Sudan based on age group during June 2014 – June 2015.

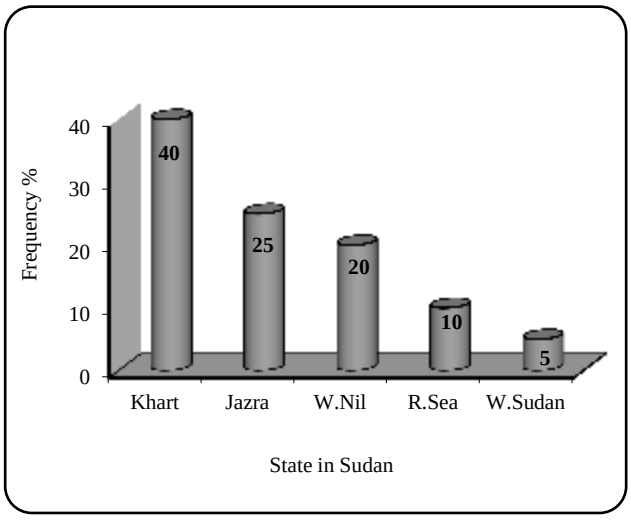

Figure 5: The incidence percent of heart diseases in the states of Sudan during June 2015 up to June 2015.

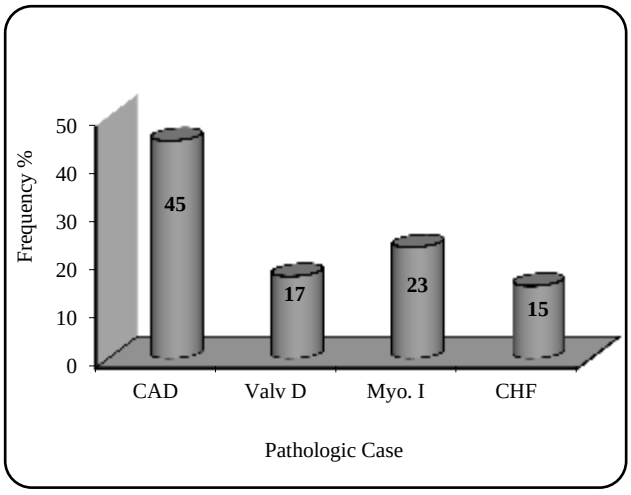

Figure 6: The common types of heart diseases in Sudan during June 2015 up to June 2015.

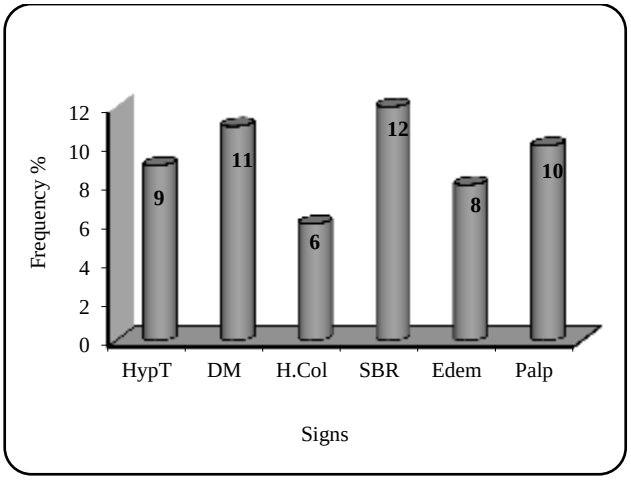

Figure 7: The common symptoms of patient's heart diseases in Sudan during June 2014 – June 2015.

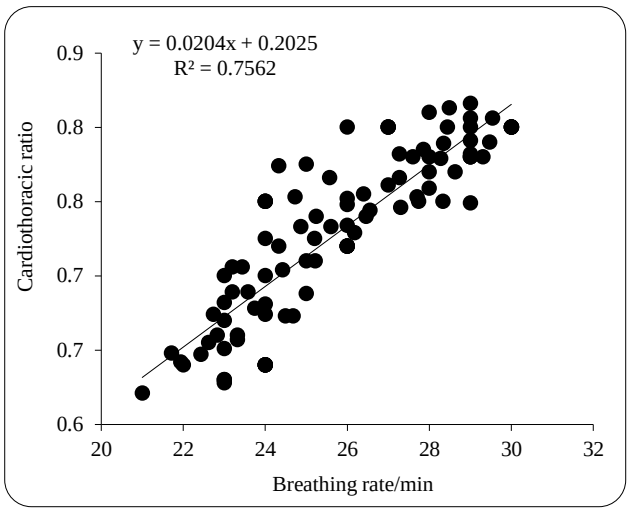

Figure 8: The correlation between the cardiothoracic ratio and the breathing rate.

Figure 9: The correlation between the respiratory rate/min and the age in years.

DISCUSSION

The analysis reveals that: the heart disease is predominant among male with a percent of 56 relative to 44% among female Figure 1. In comparison with the study carried out by Jackson et al,[19] which is agreed that the heart diseases is more common among male, such high incidence of heart diseases among male could be ascribed to different factors such as: social stress, bare economic status relative to loss or missing of the basic life needs among Sudanese male communities, and poverty as being highlighted in result Figure 2, which reveals that the most common cofactors for induction of cardiovascular diseases were the social stress, diabetes, hypertension and obesity which representing 90%, 75%, 60% and 57% respectively, with less impact of smoking and overweight which representing 40% and 35% respectively. Such facts have been agreed to some extend with the study findings given by Mendis et al,[20] in which they stated that: the diabetes (which is defined as having a fasting plasma glucose value of 7.0 mmol/l (126 mg/dl) or higher) increases the events of cardiovascular diseases by two to three folds relative to normal people, hypertension is a leading cause of CVD, smoking inducing the CVD by 10% relative to all CVD and the increment of blood cholesterol level by even 1% can put someone at a 2% higher risk of heart disease.[21] The study also revealed in Figure 3, that: the majority of the sample were either obese representing 57% or overweight representing 35%, based on the obesity conventional definition as having a body mass index (BMI) of 25 kg/m2 and 30 kg/m2, respectively.[22] Such result agreed with Adil et al,[23] in which they stated that: overweight and obesity is associated with the morbidity and mortality of many health conditions, such as coronary heart diseases CHD, Type 2 diabetes, gall bladder disease, ischaemic stroke, osteoporosis, sleep apnoea and some types of cancers. As a confirmation of obesity impact on CVD, Hubert et al;[24] concluded after 26 years of follow-up that: obesity, was a significant independent predictor of CVD, including CHD, coronary death and congestive heart failure in both gender; and stroke in women after adjustment of risk factors. Same study done by Wilson et al,[25] in which they showed that: CVD risks including angina, myocardial infarction, CHD or stroke were higher among overweight men (Relative risk and confidence interval CI, RR 1.24; 95% CI: 1.07–1.44), and obese men (RR 1.38; 95% CI: 1.12–1.69) and obese women (RR 1.38; 95% CI: 1.14–1.68) after adjustment of age, smoking, high blood pressure, high cholesterol and diabetes factors. Therefore such results strengthen the probability of CVD among the Sudanese population. And the best idea to prevent CVD and achieve an optimal health is by keeping the BMI in the median range 21–23 kg/m2 for adult populations, while the goal for individuals have to maintain a BMI in the range 18.5–24.9 kg/m2.[20]

The analysis also reveals in Figure 4, that: the HD have been increased following the age increment along the entire age groups and the high incidence occurred among age group of 65-77 years old in both gender, with obvious high incidence among younger age 35 years old. In this view Mai,[26] highlighted some early signs or precursors of CVD in youngsters interact, such as teasing behavioral (diet, exercise, sleep, smoking, screen time), environmental (neighborhood, access to parks, crowding, toxin exposure), and psychological (stress, coping, social support), however the common associated factors among the study sample were the obesity, smoking and social stress. The endemic states in Sudan with HD Figure 5, were Khartoum state showing a percent of 40% of the total sample, Aljazeera state showed 25%, White Nile showed 20%, Red Sea state showed 10% and West of Sudan showed 5%. The high incidence in Khartoum and Aljazeera states could be ascribed to high population, social stress, diabetes, hypertension, and obesity. The common types of HD (Figure 6) were the coronary arteries diseases (CAD) representing 45% of the total sample, Valves diseases 17%, Myocardial infarctions 23% and congestive heart failure was 15%. The high incidence of CAD could be due to susceptibility of coronary arteries to many pathogenic factors, for instance: progressive narrowing due to atherosclerosis, high blood pressure, high cholesterol and/or triglycerides in blood, diabetes, smoking, excessive weight, and lack of a regular exercise program.[27] These types of HD presented with common signs (Figure 7) such as Hypertension, Diabetes mellitus, High Cholesterol, breathing rate, edema, palpitation (sudden pounding, fluttering, or racing feeling in the heart) with relative frequencies 9%, 11%, 6%, 12%, 8% and 10% respectively. Such relative signs have been mentioned by WHO,[28] and the high incidence of short breathing rate, diabetes mellitus and palpitation could be ascribed to compensating breathing mechanism for having sufficient oxygen and for metabolic syndrome e.g. uric acid metabolic.[29]

Out of the correlation between cardiothoracic ratio (CTR) and the breathing rate (BR) (Figure 8), the analysis reveals that: there is obvious significant relationship (R2 = 0.8) as the cardiothoracic ration increases; the breathing rate/min increases based on equation: $y = 0.020x + 0.202$, where ‘y’ refers to cardiothoracic ratio and ‘ x’ refers to breathing rate/min. the analysis revealed that all the patients have CTR exceeding the normal range (0.5) which in turn has direct impact on the breathing rate increment beyond the normal rang 12-20 bpm.[30,31] And as has been mentioned by George et al,[32] that abnormal patterns of breathing are frequently caused by in¬jury to respiratory centers in Pons and medulla, use of nar¬cotic medications, metabolic derangements, and respiratory muscle weakness; here the factors of metabolic and respiratory muscles weakness are playing major rules. While (Figure 9) reveals a significant (R2 = 0.7) proportional relationship between the age and respiratory rate/min; fits the following equation: $y = 0.205x + 12.84$, where ‘y’ refers to respiratory rate/min and ‘x’ refers to age in years. Relative to normal respiratory rate for adults, 10 years old, 6 years old, 3 years old, 6 months

old and from birth to 6 weeks as 12-20, 15-20, 18-25, 20-30, 25-40 and 30-60 breath per minutes (bpm),[31,32] the study sample as all showed breathing rate greater than normal relative to average resting respiratory rates.

CONCLUSION

The heart diseases have been increases in Sudan with higher incidence among male and has increasing proportionality with aging and mostly prevalence in Khartoum and Aljazeera states due to obesity and overweight as confirmed factors and other cofactors as social stress, life style, smoking, economic status and poverty.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Yang Z, Wang X, Wen J, Ye Z, Li Q, He M, et al. Prevalence of non-alcoholic fatty liver disease and its relation to hypoadiponectinaemia in the middle-aged and elderly Chinese population. Arch Med Sci. 2011;665-72.
2. Bonow RO, Smaha LA, Smith SC, Mensah GA, Lenfant C. World Heart Day: the international burden of cardiovascular disease: responding to the emerging global epidemic. Circulation. 2002;(106):1602-5.
3. He Y, Jiang B, Wang J, Feng K, Chang Q, Fan L et al. Prevalence of the metabolic syndrome and its relation to cardiovascular disease in an elderly Chinese population. J. Am. Coll. Cardiol. 2006;(47):1588-94.
4. Isomaa B, Almgren P, Tuomi T, Forsén B, Lahti K, Nissén M et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care. 2001;(24):683-9.
5. Lakka HM, Laaksonen DE, Lakka TA, Niskanen LK, Kumpusalo E, Tuomilehto J et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. JAMA. 2002;(288):2709-16.
6. Philbin EF, Garg R, Danisa K. The relationship between cardiothoracic ratio and left ventricular ejection fraction in congestive heart failure. Digitalis Investigation Group. Arch Intern Med. 1998;(158):501-6.
7. Rayner BL, Goodman H, Opie LH. The chest radiograph.A useful investigation in the evaluation of hypertensive patients. Am. J. Hypertension. 2004;(17):507-10.
8. Aaronson KD, Schwartz JS, Chen TM. Development and prospective validation of a clinical index to predict survival in ambulatory patients referred for cardiac transplant evaluation. Circulation. 1997;(95):2660-7.
9. Solomon SD, Anavekar N, Skali H. Influence of ejection fraction on cardiovascular outcomes in a broad spectrum of heart failure patients. Circulation. 2005;112:3738-44.
10. Juilliere Y, Barbier G, Feldmann L. Additional predictive value of both left and right ventricular ejection fractions on long-term survival in idiopathic dilated cardiomyopathy Eur. Heart J. 1997;(18):276-80.
11. Filsoufi F, Rahmanian PB, Castillo JG. Early and late outcomes of cardiac surgery in patients with moderate to severe preoperative renal dysfunction without dialysis. Interact Cardiovasc Thorac Surg. 2008;(7):90-5.
12. Bangalore S, Yao SS, Chaudhry FA. Role of left atrial size in risk stratification and prognosis of patients undergoing stress echocardiography. J. Am. Coll. Cardiol. 2007;(50):1254-62.
13. Pritchett AM, Mahoney DW, Jacobsen SJ. Diastolic dysfunction and left atrial volume: a population-based study. J. Am. Coll. Cardiol. 2005;(45):87-92.
14. Therrien J, Provost Y, Merchant N. Optimal timing for pulmonary valve replacement in adults after tetralogy of Fallot repair. Am J. Cardiol. 2005;(95):779-82.
15. Piran S, Veldtman G, Siu S, Webb GD, Liu PP. Heart failure and ventricular dysfunction in patients with single or systemic right ventricles. Circulation. 2002;105:1189-94.
16. Kearney MT, Fox KA, Lee AJ. Predicting death due to progressive heart failure in patients with mild-to-moderate chronic heart failure. J. Am. Coll. Cardiol. 2002;(40):1801-8.
17. Lim WS, van der Eerden MM, Laing R. Defining community acquired pneu¬monia severity on presentation to hospital: an international derivation and valida¬tion study. Thorax. 2003;(58):377-82.
18. Fine MJ, Auble TE, Yealy DM. A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med. 1997;(336):243-50.
19. Jackson R, Chambless L, Higgins M, Kuulasmaa K, Wijnberg L, Williams D (WHO MONICA Project, and ARIC Study). Sex difference in ischaemic heart disease mortality and risk factors in 46 communities: an ecologic analysis. Cardiovasc Risk Factors. 1997;(7):43-54.
20. Mendis, PekkaPuska, Bo Norrving. Global Atlas on cardiovascular disease prevention and control. Published by WHO in collaboration with the World Heart Federation and the World Stroke Organization-Geneva. 2011.
21. DeBakey ME, Gotto AM. The living heart in the 21st. century. Amherst, N.Y.: Prometheus Books 2012.
22. Haslam DW, James WT. Obesity. Lancet. 2005;(366):1197-1209. http://dx.doi.org/10.1016/S0140-6736 (05)67483-1.
23. Adil M, Maula F, Nadeem M, Zaman S, Bilal M, Nawaz R. Prevalence of overweight and obesity in

health employees. Gomal J. Med. Sci., 2013;(11):59-62.
24. Hubbell FA, Greenfield S, Tyler JL. The impact of routine admission chest X-ray films on patient care. N Engl J Med. 1985;(312):209-13.
25. Wallis LA, Healy M, Undy MB, Maconochie I. Age related reference ranges for respiration rate and heart rate from 4 to 16 years. Arch Dis Child. 2005;(90):1117-21. doi: 10.1136/adc.2004.068718.
26. Mai Thanh Tu. Financial Strain, Stress & Health: The Contribution of Quebec & Canadian Researchers. Mammoth Magazine. 2010;(8):1-8.
27. Bhatia SK. Biomaterials for Clinical Applications, Springer New York Dordrecht Heidelberg London. 2010.
28. World Health Organization. Cardiovascular Disease. Fact sheet No 317. Geneva. September 2009. Accessed on 30 October 2015 at: http://www.who.int/mediacentre/factsheets/fs317/en/index.html, 30 October 2015.
29. Qin Li, Zhen Yang, HongxiaGu, Shuai Lu, Qun Shi, Yin Xing et al. Association between serum uric acid levels and cardiovascular disease in middle-aged and elderly Chinese individuals. BMC Cardiovascular Disorders. 2014;(14):26.
30. De Boer SL. Emergency Newborn Care. Victoria: Trafford. 2004:30.
31. Lindh WQ, Pooler M, Tamparo CD. Delmar's Comprehensive Medical As¬sisting: Administrative and Clinical Competencies. New York: Cengage Learning. 2006:573.
32. George Yuan, Nicole A. Drost, R. Andrew McIvor. Respiratory Rate and Breathing Pattern, Clinical Review. 2013;10(1):23-5.

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