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Fundus Oculi Changes

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Highlights

Child with Cerebral Palsy

Microalbuminuria and Fundus

Discovering Thoughts, Inventing Future

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The Relevance of a Significant Correlation Between ET-1 and Clinical Markers Such as Microalbuminuria and Fundus Oculi Changes in Early Detection of Diabetic Nephropathy in Type 2 Diabetes

By Benereta Hoxha, Ilir Arapi & Elsa Kone
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Abstract- Prolonged hyperglycemia and insulinre-sistance in type II diabetes are the main factors contributing to the damage of the vascular endothelium (endothelial dysfunction) leading to micro and macroangiopathy which result in significant amounts of damage towards many internal organs such as cardiovascular diseases, diabetic retinopathy (DR) and nefropathy (DN). Those pathologies frequently result life threatening for the patient.

The employment of high-sensitivity biomarkers for the early detection endothelial dysfunction in general and more specifically for the renal endothelial dysfunction seems to represent a major step ahead towards an improvement in the management algorithms of diabetes and its severe complications.

Keywords: biomarkers, endothelin-1, microalbuminuria, fundus oculi, diabetes, diabetic nephropathy.

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The Relevance of a Significant Correlation Between ET-1 and Clinical Markers Such as Microalbuminuria and Fundus Oculi Changes in Early Detection of Diabetic Nephropathy in Type 2 Diabetes

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The employment of high-sensitivity biomarkers for the early detection endothelial dysfunction in general and more specifically for the renal endothelial dysfunction seems to represent a major step ahead towards an improvement in the management algorithms of diabetes and its severe complications.

Purpose The aim of our study is to discover the correlations of endothelin-1 (ET1) with known clinical markers of endothelial dysfunction such as microalbuminuria (MA) and fundus oculi (FO) findings in order to help an early detection of renal damage and consequently preventing or slowing progress of diabetic nephropathy (DN).

Materials and methods: This is a prospective study where some eighty type 2 diabetes patients were recruited and were dichotomized in 2 groups. In the first group were included forty patients with normoalbuminuria (urinary albumin 0-30 mg/24 hours) while in the second were included the remaining forty patients with microalbuminuria (urinary albumin 30-300 mg/24 hours). Plasma ET-1 levels and 24 hour urinary excretion of albumin were measured. Diabetic retinopathy assessment was made according to the International Clinical Diabetic Retinopathy Disease Severity Scale which includes 5 severity scales. The first scale without retinopathy, the second of light retinopathy non proliferative, the third of moderate non proliferative and the fourth severe retinopathy non proliferative and the fifth one of proliferative retinopathy.

Results: We found a statistically significant correlation between ET-1 and MA ($p<0.001$) and ET-1 with fundus oculi ($p<0.032$), where the higher values of ET-1 were observed in the group with diabetic retinopathy changes. The level of changes between FO and ET-1 were proportional (higher ET-1 responded to higher scale of retinopathy) and of MA with fundus oculi ($p<0.001$).

Keywords: biomarkers, endothelin-1, microalbuminuria, fundus oculi, diabetes, diabetic nephropathy.

I. Introduction

Diabetic nephropathy (DN) represents one of the most frequent complications of diabetes and recently it has been baptized as a worldwide spread medical catastrophe (Dr. E Ritz)[1].

Microalbuminuria (MA) is an early clinical marker of DN[2] being an essential parameter in establishing tubular and glomerular damage. MA represents an expression of systemic capillary damage which starts with endothelial dysfunction[3,4].

Prolonged hyperglycemia and insulin resistance in type II diabetes are the main factors contributing to the damage of the vascular endothelium (endothelial dysfunction) leading to micro and macroangiopathy[5] which result in significant amounts of damage towards many internal organs frequently being life threatening for the diabetic patient.

Vascular endothelium acts as a potent and active barrier[5,6] involved in preserving the vasomotor balance and the delicate homeostasis of the vascular tissue continuously reacting to different chemical and physical stimuli through the modification of the vessel diameter and by producin[7,8,9] several vasoactive substances, various substances involved in intravascular coagulation, inflammatory and anti-inflammatory mediators, etc.

In order to ensure an early detection of the endothelial dysfunction in the medical environment are being successfully employed different clinical markers such as MA and Fundus Oculi (FO) examination and different biomarkers such as endothelin-1 (ET-1) which has shown to be fundamental in detecting earlier this dysfunction.

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ET-1 was discovered back in 1988 as a peptide with potent vaconstrictor effects[10]. It was first discovered in the coronary arteries and afterwards in muscle cells, renal tubular epithelium, glomerular mesengial cells, nervous glial cells, macrophages, etc.

Endothelin exists in three forms: ET-1, ET-2, and ET-3. The first one is known as the most effective vasoconstrictive[11] substance amongst them. Under normal conditions the endothelium preserves the balance by maintaining the equilibrium between the production of vasodilatatory substances such as nitric oxide (NO), prostacyclin, endothelium-derived hyperpolarizing factor (EDHF) and vaconstrictive substances such as endothelin, angiotensin II, etc[12].

II. Materials and Methods

In the study were recruited eighty (80) patients with type II diabetes that were receiving oral antidiabetic treatment. Patients were examined at the Specialties Polyclinic N. 3 in Tirana, Albania between september 2010 and december 2013. The diagnosis of type II diabetes was made according to the criteria published by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (WHO13 criteria). Patients were dichotomized in 2 groups. In the first group were included forty (40) patients with normoalbuminuria while in the second were included the remaining forty (40) patients with microalbuminuria. Patients were selected on the basis of diabetes duration (2-5 years) and the level of urinary albumin excretion during the 24 hours (where normoalbuminuria consists of urinary albumin excretion of 0-30 mg/24 hours and microalbuminuria consists of urinary albumin excretion of 30-300 mg/24 hours). All patients underwent dilated FO examination by indirect ophthalmoscopy and the changes observed were divided in 5 severity scales consisting in: grade 1 - No apparent Retinopathy; grade 2 - light retinopathy non proliferative; grade 3 - Moderate non-proliferative Diabetic Retinopathy; grade 4 -Severe Non-Proliferative Diabetic Retinopathy; grade 5 - Proliferative Diabetic Retinopathy14.

In order to evaluate ET-1 levels the patients underwent 5 cc of blood sampling while they were sober. Blood sampling was made with K3EDTA tubes and was centrifuged at a speed of 2500 rpm. ELISA test kit (DRGR Free PSA ELISA (EIA-1550) – DRG International) technology with calibration curve of three was employed as analytic kit. Measurements were done with ELISA HUMAN HS (Human Germany Company) with lecture filter 450 nm, correction filter 650 nm, where the measuring unit is nanograms per mililiter (ng/ml) and a standards number of 5.

The values of the standards were as follows: S1 0.01ng/ml, S2 0.1ng/ml, S3 1.0ng/ml, S4 10ng/ml, S5 100ng/ml.

III. Statistical Analysis

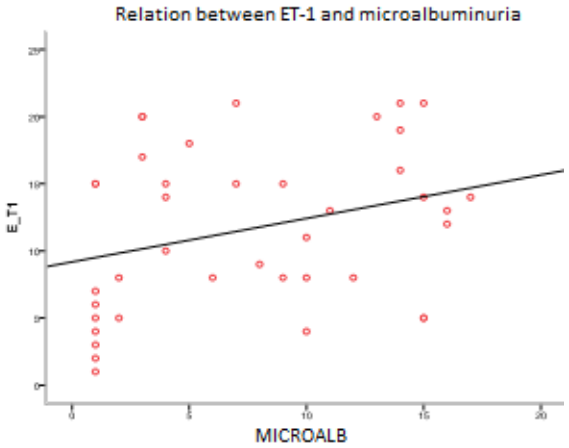
Continuous data were presented as mean value ± standard deviation (SD). Discrete data were presents in absolute value and percentage. Data were displayed on different tables and graphics such as bar and scatter diagram, surface graphic. Differences between continuous variables obtained in the 2 groups were analyzed with student <t> test and the ANOVA analysis of variance when comparing more than 2 groups. The differences observed between the groups regarding discrete variables were calculated by Chi-squared test. The relation between variables was analyzed through Pearson correlation coefficient and Kendall's tau coefficient. A P value less than 0.05 was considered significant. SPSS 19.0 was employed as a statistical software program in order to analyze data.

IV. Conclusion

The study included 80 patients with a mean age of 55.78 ± 7.72 (SD) years. Of those 59% were males and 41 % females.

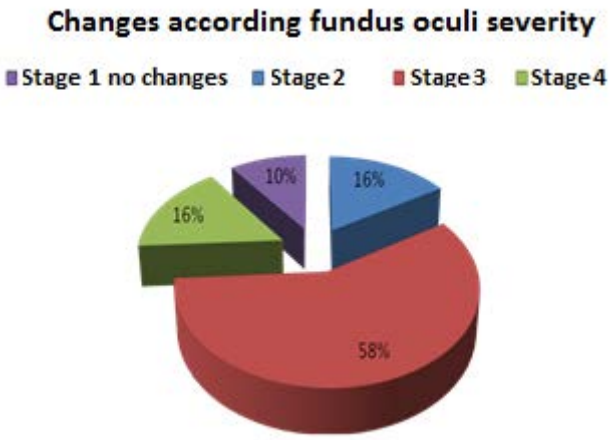
Variables	Normoalbuminuria	Microalbuminuria	Total	F value	p* value
Age	55.18±9.325	59.70±7.928	55.78±7.722	6.094	0.004
Years with diabetes	3.00±1.342	3.90±1.210	2.27±2.029	76.207	<0.001
ET_1	1.20±0.485	1.23±0.504	1.18±0.519	7.315	0.032

**Analysis ANOVA*



By analyzing the average values for the variables above, through one-way ANOVA analysis, Bonferoni procedure, it was observed that there was a statistically significant difference between groups regarding age (average age was higher in the group associated with MA), diabetes duration (the group associated with MA had a longer duration of diabetes) and the biomarker of endothelial dysfunction where ET-1 mean values resulted higher in the group associated with MA.

Changes in Fundus Oculi according to the different grades of diabetic retinopathy (DR)		
Fundus Oculi	Nr. Of patients	Percentage
No apparent retinopathy – severity scale I	8	10
Severity scale II	13	16
Severity scale III	46	58
Severity scale IV	13	16
Severity scale V	0	0



By analyzing the relation between ET-1 levels and FO findings we found that ET-1 levels were higher in patients whose retinas were affected by DR as compared to those patients whose retinas were unaffected by DR.

V. Discussion

a) Endothelin-1 and albuminuria

In type II diabetes there is a long term operating stress15 mediated by hyperglycemia and insulinresistancy resulting in increased quantities of vasoconstrictive substances which undermine the delicate balance and create the conditions for the presence of endothelial dysfunction. This is a finding which first appears in glomerular endothelium after the break down glomerular filtrating barrier (starts with glycocalix)[16]. This is followed by MA, whose rate of excretion runs parallel with the degree of damage.

MA is a measurable parameter and allows us to select it as a first choice biomarker in the assessment of glomerular endothelial dysfunction and consequently this appears to be the main reason why we included two groups of patients with and without MA in our study. The ET-1 levels in the normoalbuminuric group were 1.20±0.485, in the microalbuminuric group they were 1.23±0.504. In the light of this result we can assume that ET-1 levels begin to rise in the first years after diabetes' appearance suggesting also the presence of endothelial dysfunction during this period. These findings try to elucidate the role of hyperglycemia on the vascular endothelium and the associated changes on its homeostasis.

We found a statistically significant correlation between ET-1 and MA ($p<0.001$). This is a fundamental result of our study and allows us in affirming its important role in evaluating renal endothelial dysfunction.

Hyperglycemia[17] affects the metabolism by helping the production of free radicals and reactive oxygen species (ROS), by increasing oxidative stress, by activating protein kinase C (PKC). This cascade of events has a negative influence on the production of a known vasodilatory and antiatherogenic substance such as NO by reducing the quantity of eNOS cofactors. By decreasing NO production hyperglycemia helps in increasing ET-1 expression and its potent vasoconstrictive effects. The reduction of NO biodisponibility leads to an increase in the number of adhesion molecules which on the other hand exert a chemotactic effect mostly on neutrophils and macrophages. The breakdown of glomerular endothelial glycocalyx in the kidney by proinflamatory cytokines such as tumor necrosis factor α (TNF-α)[18] shall render the renal endothelium unable to preserve it negative charge leading thus to albumin excretion in the urine.

Endothelin receptors are subdivided into A and B types[19]. Type A receptors are blamed of causing sodium-dependent systemic arterial hypertension while acting in the kidneys. This type of hypertension can also

include inflammatory nitric oxide synthetase (iNOS) and type B receptors.

One of the mechanisms contributing to endothelin-mediated glomerular damage is its influence on nephrin protein that has a direct impact on renal filtrating barrier.

The cascade of events leading to the damage of the filtrating barrier begins with the glomerular glycocalyx and continues with renal endothelium which gradually goes toward dysfunction and albumin excretion whose grade depends on the severity of damage suffered by the endothelial cells, a factor majorly accounting for the increasing plasmatic levels of reacting endothelial substances such as ET-1. This close relationship between ET-1 and albuminuria is confirmed by other papers such as year 2008 in which this finding was statistically significant in 279[20] diabetic patients. In another paper it was found to exist a statistically significant correlation between ET-1, von Wilenbrand (vW) factor and albuminuria[21].

b) ET-1 and Fundus Oculi

All patients underwent dilated FO examination by indirect ophthalmoscopy.

Our data shows that in the group of patients with normoalbuminuria only 10% of the patients did not show signs of (DR) stage 1- (no apparent retinopathy), 16% of the patients had stage 2 DR (Mild Non-Proliferative Diabetic Retinopathy), 58% had stage 3 DR (Moderate Non-proliferative Diabetic Retinopathy), and only 16% of the patients had stage 4 DR (severe non proliferative diabetic retinopathy) and none of fifth grade. The 16% of patients with third grade diabetic retinopathy were normoalbuminuric patients suffering from arterial hypertension.

In the group of patients with MA 12% of patients had stage 1 DR, 65% had stage 2 DR and 23% had stage 3 proliferative DR. These data suggest that changes in the fundus oculi are related to retinal endothelial dysfunction and may be visible even in the first 2 years of diabetes appearance. Moreover these changes have a tendency to be more prominent by the presence of other risk factors such as arterial hypertension, a finding which was frequent in a subgroup of our patients. The strong relation observed between FO and the excreted amount of albumin where ($p<0.001$) and the changes depicted in FO and ET-1 where ($p<0.032$) bare suggestive hints regarding nature of this dysfunction, which seems to affect in the same way the vessels of small caliper (renal and retinal endothelium), and at the same time reconfirms the importance of these clinical markers in evaluating this dysfunction.

This can be explained with the functional changes suffered by the endothelium of small vessels in the retinal and glomerular tissue due to endothelial dysfunction. Hyperglycemia exerts its effects mainly through 4 elucidated mechanisms in MA[22] (polyol path, AGE (Advanced Glycation end Products, PKC (Creatine Phospho Kinase) and hexamine) which lead to an increase in inflammatory cytokines, vascular endothelial growth factor (VEGF) production and consequently to hyperpermeability and neoangiogenesis phenomenon. VEGF inhibits renal and retinal hypertrophy. It prevents cellular dysfunction regarding intracellular NO production[23,24]. The predominance of substances inhibiting production of NO from arginine25 and the reduction of NO biodisponibility shall lead to an important endothelial dysfunction in the retina and kidney manifesting with urinary excretion of albumin.

VI. Conclusion

Based on the results of our study we can affirm that ET-1 is a very significant biomarker in the early detection of renal endothelial dysfunction. Raised plasmatic ET-1 levels in type 2 diabetic patients are a major clue in helping the general practitioner uncover this dysfunction and to intervene timely in order to prevent or slow DN from its early stages.

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Scurvy in a Child with Cerebral Palsy- The Forgotten Vitamin Deficiency: A Case Report

By Dr. Raghavendra. K, Dr. Suresh Babu., Dr. Basavanthappa., Dr. Srinivas.V, Dr. Srinivas Murthy. C.L, Dr. Rajath Pejaver & Dr. Nikil. P. T

Basaveshwara Medical College and Hospital, India

Abstract- Scurvy was the first vitamin deficiency disease to be described. However it is seldom seen in the pediatric age group. It is often missed, especially amongst physically and mentally disabled patients who form a high risk group for this disease. Scurvy can present with a varied spectrum of signs and symptoms. Here we present a case of scurvy in a child with cerebral palsy.

GJMR-F Classification : *NLMC Code: WD 140, WD 100 ,WD 105*

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Scurvy in a Child with Cerebral Palsy- The Forgotten Vitamin Deficiency: A Case Report

Dr. Raghavendra. K [α], Dr. Suresh Babu. [σ], Dr. Basavanthappa. [ρ], Dr. Srinivas. V [ω], Dr. Srinivas Murthy. C.L [¥], Dr. Rajath Pejaver [§] & Dr. Nikil. P. T [χ]

Abstract- **Scurvy was the first vitamin deficiency disease to be described. However it is seldom seen in the pediatric age group. It is often missed, especially amongst physically and mentally disabled patients who form a high risk group for this disease. Scurvy can present with a varied spectrum of signs and symptoms. Here we present a case of scurvy in a child with cerebral palsy.**

I. Introduction

A deficiency of Vitamin C (ascorbic acid) results in the clinical presentation of Scurvy, the oldest nutritional deficiency to be recognized. A disease that was once rampant is now rarely seen, more so in the pediatric age group.

Scurvy presents with swelling of joints with characteristic radiological changes, gum bleeds, anemia, petechiae (perifollicular), muscle weakness, fractures and poor wound healing. Here we report a case of scurvy in a child with cerebral palsy and developmental delay.

II. Case Report

A 18 month-old boy with quadriplegic cerebral palsy and pseudobulbar palsy due to perinatal asphyxia was admitted to the department of Pediatrics with history of swelling and pain of right knee joint with gum bleeds of 7 days duration. Child also had excessive irritability especially when picked up, along with fever. There was no history of trauma. The child was on a predominant milk based diet, with minimal intake of fruits and vegetables. He was on long-term phenytoin and phenobarbitone therapy for seizures.

On examination, the child had acute malnutrition (wt= 6.5kg, IAP grade 3) and microcephaly (HC- 34 cm). He was febrile, pale and had no hepatosplenomegaly or lymphadenopathy. The right knee joint was swollen and tender, with the skin on the joint appearing shiny, red and warm. There was minimal movement of the right lower limb. A possibility of septic arthritis was considered and intravenous antibiotic therapy initiated. Orthopedic opinion was sought and the limb was immobilized with a POP cast. The laboratory data results were as follows:

Hb:10.6 g/dl ; TC:7200 cells/mm3 ; DC: P55%,L42%,E3%; ESR: 45 mm/hr;RBC Count: 4.7 million/mm3;MCV:68.5 fl;MCH:22.6 pg; MCHC:32.9 %; Platelet :2.31 Lakh/mm3 ; Calcium: 9.2 mg/dl; S.Alkaline Phosphatase:102 IU/dl ;S.Phosphate: 3.7mg/dl.

The radiograph of the knee (Figure 1) showed: Ground glass appearance of the shaft of the tibia, fibula and femur. White line of Frankel (irregular, thickened white line at the metaphysis) and a characteristic zone of rarefaction under the white line at the metaphysis (Trumerfeld zone). A lateral prolongation of the white line at the cortical ends, known as Pelkan spur was seen. Subperiosteal elevation suggestive of a subperiosteal hemorrhage was seen at the lower end of the femur. All radiological features pointed towards scurvy. The diagnosis was confirmed with serum levels of vitamin C being less than the lower limit of normal. The child also had low levels of vitamin D possibly due to lack of sunlight exposure, dietary deficiencies and chronic anticonvulsant therapy. (Vitamin C: 0.5mg/dl ; 25 OH-Vitamin D: <3micg/ml).

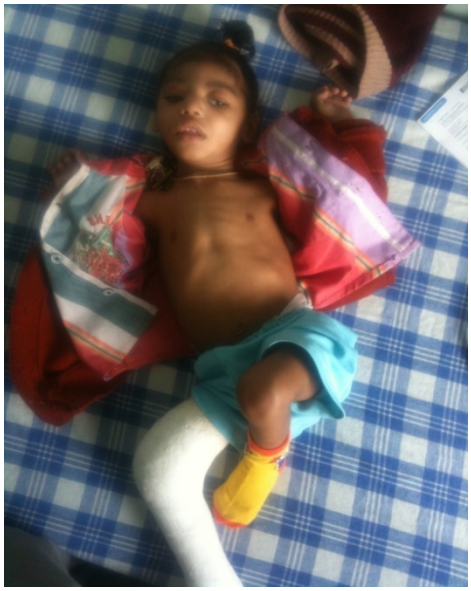

Fig 1 : Child with POP cast , malnutrition and microcephaly

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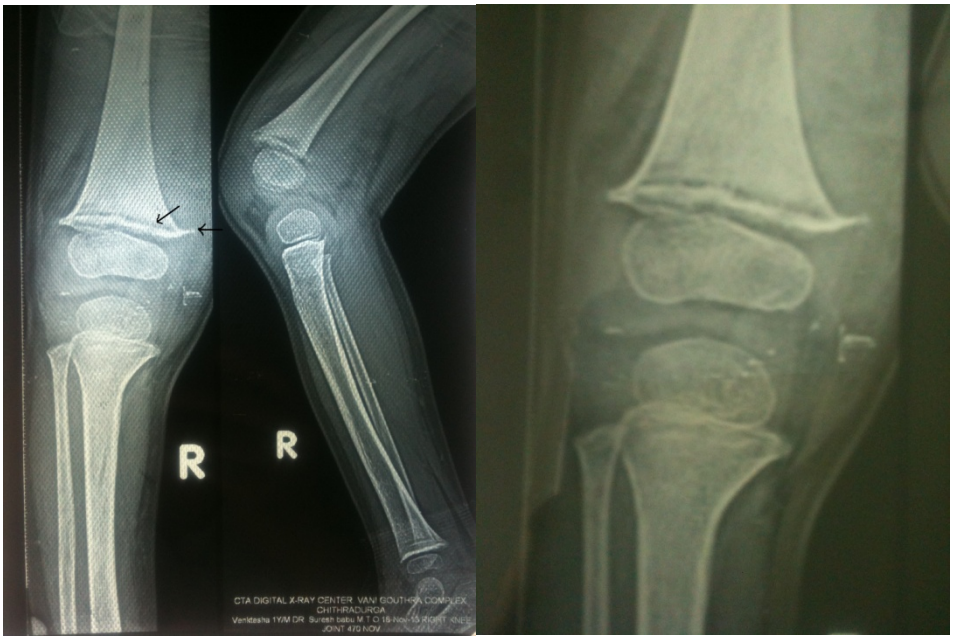

Fig. 3,4 : X-Ray AP & Lateral of knee joint showing Pelkan spur& white line of Frankel(arrows), Trumerfeld zone

III. Discussion

The diagnosis of scurvy was made, and the child was treated with 250mg of vitamin C daily. Vitamin D 6 lakh IU was also administered. His mother was educated about dietary modification. Two weeks after vitamin C administration, the child's general condition and joint swelling improved. Repeat X-ray of the knee joint showed features suggestive of healing.

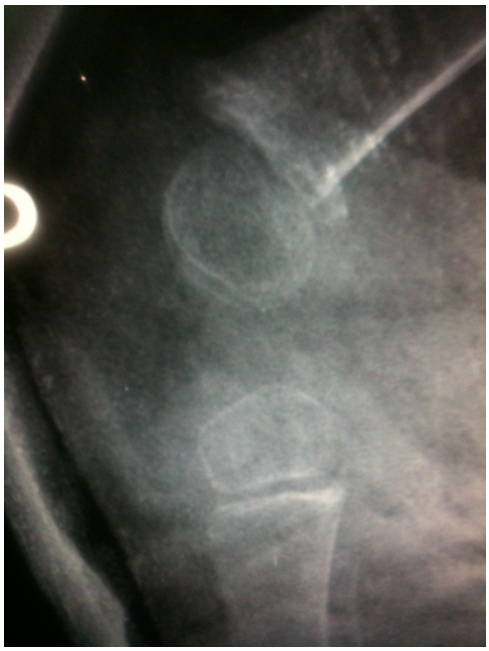

Fig. 4 : X ray of knee joint showing healing

Scurvy is less common in the pediatric population, but case reports still appear [1–3]. A review of the literature by Noble et al. reveals twenty three case reports of scurvy in children with behaviourally restricted diets including children with autism, mental retardation and cerebral palsy[4]. Scurvy is common in children with cerebral palsy as they subsist on predominant milk based diets (due to pseudobulbar palsy and difficulty swallowing solids) and boiled cows milk is a very poor source of vitamin C. deficiencies may be noted in preterm babies who are on prolonged TPN therapy, children with malnutrition and those with acute illnesses. Musculoskeletal manifestations are present in 80% of patients with scurvy and are prominent in pediatric population [3, 5]. Musculoskeletal manifestations include sub-periosteal hemorrhages leading to bone pain and musculoskeletal complaints such as limb pain, limping, swelling over long bones, and progressive leg weakness and fractures [6]. Dermatological manifest-tations include petechiae, ecchymoses, hyperkeratosis, and perifollicular hemorrhage [3, 7]. Oral symptoms include gingival disease characterized by swelling, bleeding gums, and loosening of teeth [3, 6, 8]. Systemic symptoms of scurvy in children include lassitude and fatigue, failure to gain weight, loss of appetite, and irritability [6]. In addition to these symptoms, deficiency of ascorbic acid may lead to a hypochromic microcytic anemia because of decreased absorption of iron, bleeding, and dietary deficiencies [3, 6].

The diagnosis of scurvy is based on history of poor dietary intake of vitamin C, classic clinical features and radiological findings and response to treatment with vitamin C. [3, 14]. Weinstein et al. [3] recommend oral doses of 100 to 300 mg of vitamin C daily until body stores are replenished per serum levels. Daily fruit and vegetable intakes should include a good source of

vitamin C such as citrus fruits, berries, green leafy vegetables and vegetables of brassica and crucifera family. Once a regimen of vitamin C is begun, improvement of symptoms usually begins in 24 hours, with pain diminishing in two to four days, and gingival lesions recovering in two to three weeks [6]. With vitamin C supplementation, metaphyseal abnormalities of scurvy will completely resolve [9]. The large shells of periosteal bone are common radiographic findings particularly during the healing phase of disease [12].

Various factors contribute to nutritional deficiencies in non ambulant children with severe spastic cerebral palsy like poor intake, oral motor dysfunction, feeding problems, and use of antiepileptic drugs [13].

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The Importance of Pediatric Scoring Systems of Multiorgan Failure in Intensive Care Unit

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Abstract- *Introduction:* Use scoring systems facilitates and enables decision making about the appropriate therapeutic treatment (right evaluation and classification of the patient group at high risk), which can also increase the likelihood of survival rationalize a decision on the need and intensity of therapy.

Aims: To analyze the Pediatric Logistics Organ Dysfunction Scoring system (PELOD) and Pediatric Risk Score of Mortality (PRISM), in the surgical intensive care unit (ICU) of tertiary pediatric medical facility.

Methods: The study included a 90 patients aged 0-18 years, in the period of three years. To analyze parameters of the PELOD and PRISM score. In the analysis were used statistical data about predictors of mortality: Receiver Operating Characteristics (ROC) curve and Hosmer-Lemeshow goodness of fit test (HL-GOF).

Keywords: *pediatric scoring systems, multiple organ dysfunction syndrome-MODS, intensive care unit.*

GJMR-F Classification : *NLMC Code: WI 140, WS 205, WD 300*

Strictly as per the compliance and regulations of:

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Abstract- Introduction: Use scoring systems facilitates and enables decision making about the appropriate therapeutic treatment (right evaluation and classification of the patient group at high risk), which can also increase the likelihood of survival rationalize a decision on the need and intensity of therapy.

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Results: The mean value of PRISM score in the group of patients with favorable outcome of treatment was 8 and with lethal outcome 18. The mean value of PELOD score in the group of patients with favorable outcome of treatment was 7.7 and with lethal outcome 17.7. The area under the ROC curve for the PRISM score was 0.8306, for the PELOD score it was 0.7967. Calibration values expressed in HL-GOF for PRISM score were 2.913,while the PELOD score they were 0.60971).

Conclusion: Initial assessment, daily monitoring and reliable prediction of the final outcome of the application of pediatric scoring systems allow rising efficiency and rationalization of work in an intensive care unit.

Keywords: pediatric scoring systems, multiple organ dysfunction syndrome- MODS, intensive care unit.

I. Introduction

Dysfunction and organ failure in the sepsis is very common and serious complication of the most serious ill patients. Research on various factors in explanation of sepsis occurrence, imposed a concept that was accepted at the International Conference on definitions of sepsis from 2001. The diagnosis of sepsis is based on defined criteria Association Consensus Conference Chest Physicians and Intensivists (ACCP / SCCM) [1,2] Multiorgan dysfunction syndrome (Multiple Organ Dysfunction Syndrome-MODS) is the most common cause of death in the pediatric intensive care units, with frequency range of 26-50% [3,4]. In adult patients, mortality due to MODS is of a similar value [5], according to Bilevicius and associates data the level of mortality reaches 85% [6]. It is believed that the high mortality is a direct result of the progression of organ system failure [7,8] because a direct link has been proved between mortality and the number of affected organ systems, as well as between mortality and the severity of their dysfunction [9,10]. Wilkinson, Proulx and associates also point out in their studies that the mortality caused by MODS directly depends on the number of affected organ systems [11].

Different scoring systems for the estimate of severity of illness in intensive care units emerged from the gaining of clinical experiences, primarily as a response to a question on the efficiency and quality of a treatment. In the last decade scoring system has developed on the basis of results of multicenter studies. A separate category for the estimate of the severity of illness are so-called score table which make it possible to statistical calculate the probability of survival (PS-Probability of Survival) and the probability of dying (PM-Probability of Mortality) [12]. The ideal scoring system does not exist, but a good score definitely has to meet several basic requirements: first of all, the system must be simple, mathematically consistent, research results should have high sensitivity and specificity, and environmental factors should not affect the tests which make point system [13].

The largest number of scores that are now used in intensive care units are primarily related to the adult population. Threfore, the pediatric scores that are used in clinical practice, usually resulting from the pre-existing scores for adult patients. However, the specific physiology of pediatric patients has imposed a need to establish scores that just respect these facts. These are primarily characteristic pulse and systolic pressure caused by age, specific dynamics of water and electrolyte metabolism with an increased tendency towards metabolic acidosis, a relatively small amount of circulating volume, the immaturity of immune system and the difficulty in the maintaining of body temperature.

a) Pediatric Risk Score of Mortality (PRISM)

PRISM score is used in age from the newborn to adolescence and shows the seriousness of the illness on the basis of disorders of the observed physiological

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and clinical parameters, with the additional verification of pathological findings in special laboratory tests. This score, however, did not appear to be useful enough with premature babies [14]. There are several versions of this scoring system which was first applied in clinical practice under the name the physiological stability index (Physiologic Stability Index-PSI). Originally, 24 physiological parameters were followed by this score [15,16]. It was published in the literature 1986, as a dynamic assessment of the patients condition [17]. Pollack and his collaborators published a new version of the score in 1988, giving it the final name Pediatric Risk of Mortality (PRISM). This point system was by then named PRISM II score by some intensivists, which definitely separated it from the initial PSI scoring system, which was also defined as PRISM I score. PRISM II scoring system included 14 parameters, and its dynamic estimation according to the daily analysis type was first shown in 1991's [18]. Score values in the range of 0-76. Table 1 shows the parameters that make the PRISM II score.

b) Paediatric Logistic Organ Dysfunction score (PELOD)

The scoring system which is applied to the dysfunction of various organs in the pediatric age group was described in detail by Leteurtre in 1999. The score included the evaluation of the condition of the six organ systems (cardiovascular, respiratory, hepatic, renal, hematological and central nervous), and the possible existence of the dysfunction some of the selected organ systems. This score is also part of the dynamic scores, because it means a daily record of 12 observed parameters of organ dysfunction [3]. In addition, physiological parameters that are dependent on the age of patients (neonatal, infant, toddler, school age and adolescents) are continuously recorded [19,20]. Table 2 gives the parameters of PELOD score.

II. Aims

Analyzing the clinical value of pediatric scoring systems, Pediatric logistics organ dysfunction score (PELOD) and Pediatric Risk score of Mortality (PRISM), in the presence of sepsis accompanied by multiple organ dysfunction syndrome (MODS) in the surgical intensive care unit of tertiary pediatric hospital.

III. Methods

The study was conducted at the Intensive Therapy of Pediatric Surgery Clinic in Novi Sad in the period of 36 months. The method of random selection was applied, and it included 90 patients who were previously treated surgically or primarily located in the intensive care unit.

On the basis of the results of analyzed scoring systems and their completed correlation with the expected and actual (real) mortality, checking out of the prognostic reliability of the examined systems carried out. The study data are numerical and they were analyzed by standard procedures of descriptive and comparative statistics. ROC (Receiver Operating Characteristics) analysis was also used in the evaluation of score value for predicting of hospital mortality. Lemeshov Hosmer goodness of fit test was also used in the evaluation of the expected and actual (real) mortality and it present the measure of the degree of calibration. [21,22,23].

IV. Results

The study included 90 patients aged 0-18 years treated at the Pediatric Surgery Clinic in Novi Sad, in the Intensive Care Unit. The average annual number of patients hospitalized in the intensive care unit of the Pediatric Surgery Clinic was 195, with a reported mortality of 8.8%. Out of the total number of patients, in 10% of patients MODS have developed, with a mortality rate of 62%. In the group of newborn babies there were total of 39 examined patients (43.3%). The group of infants had a total of 10 examined patients (11.1%). In the group of patients over 12 months there were 41 patients (45.5%). The gender distribution in the study was equal: 42 female subjects (46.6%) and 48 males (53.3%). The average length of stay patients in the ICU for the total number of patients was 10.3 days. With patients with lethal results 18.6 days, and in cured patients 8.2 days. By the analysis of outcome, 72 patients (80%) survived, and death outcome was noted in 18 (20%) patients.

a) PRISM score

For the total number of examined patients, the mean PRISM score was 10.0. The mean value of the PRISM score in the group of patients with favorable outcome was 8, and with patients with lethal results 18.

b) PELOD score

For the total number of examined patients mean PELOD score value were 9.5 The mean PELOD score value in the group with favorable outcome was 7.7. In the group with lethal outcome it was 17.7.

c) The results of ROC analysis

The showing of PRISM score values using ROC curve (Figure 1). In area under the curve in our results for the PRISM score was 0.8306, which indicates a very good prediction of PRISM score in relation to the final outcome.

d) Application of ROC analysis for PELOD score

The showing of PELOD score values using ROC curves (Figure 2). The area under the curve was 0.7967,

which also proves a good prediction of PELOD score in relation to the final outcome.

The prediction of outcome based on the PRISM score value using logistic regression

Based on the PRISM score value, using the Hosmer-Lemeshov goodness-of-fit test, the predicted mortality was compared to the current. (Table 3).

Predicting outcomes based on the PELOD score value using logistic regression

The table 4 shows the probability of lethal outcome based on the of PELOD score values and using logistic regression. (Table 4).

Table 5 gives a collective survey of the examined scores and their comparisons. Hosmer-Lemeshov GOF, ROC curve and standard error tests were valued. Based on the comparison of the examined scores better calibration results were obtained for PELOD score, while the results of discrimination with the ROC curve indicates greater reliability PRISM score, using the statistical method.(Table 5).

V. Discussion

In recent years, the complexity of intensive treatment need for more objective assessment of weight status of patients and their ultimate prognosis. Using of scoring systems, it is possible to not only predict the final outcome, but also to compare groups of patients within one health facility or among multiple institutions.

In our study, the average number of patients hospitalized in the intensive care unit of the Pediatric Surgery Clinic at the annual level was 195, with recorded mortality of 8.8%. MODS developed in 10% with a mortality rate of 62%. In our study, despite the relatively low incidence of MODS, mortality rate is high. Data from the literature for the pediatric population are very often different, mostly because in some pediatric intensive units both pediatric and surgical patients are treated together. The data of Tantalean and associates suggest that the frequency of MODS in the intensive care unit is 25% and mortality from 26-50% [4]. Proux states that the frequency of MODS was recorded from 11-27% [9], and Wilkinson gives data on mortality of 54% [11]. The analysis of the study results considering patients age, showed that nearly half of examined patients belong to the group of infants (43.3%). According to published data from the USA, age is a significant factor in the epidemiology of sepsis. It is thought that children up to one year, especially newborns, are the patients with the significantly greatest risk of sepsis development, with even up to 10 times more bigger risk compared to the other categories of pediatric patients [8]. The total number of participants, males and females was almost equal: 46.6% female and 53.3% males. Watson and associates, in their epidemiological study of sepsis in the pediatric age, indicate that boys under 10 years occur more frequently than girls, but there is not a significant difference in their recording mortality [10]. When it comes to the final outcome of treatment, no gender predisposing is noticed in the analyzed literature.

For the total number of observed patients, the mean PRISM score value was 10.0. The mean PRISM score value in the group of observed patients with favorable outcome was 8, and with lethal outcome it was 18. In our study, PRISM score values over 10 indicated a possible unfavorable outcome. Different from this, Tantalean and associates, in their study, with patients with lethal outcome, got results which showed the average values of PRISM score of 22.07, but also relatively high mean values of PRISM score even with patients who survived [4]. For the total number of the observed patients, the results of mean values of PELOD score were 9.5. In our survey, the mean value of PELOD score in the group with favorable outcome of treatment was 7.7, whereas in the group with lethal outcome it was 17.7. In Leteurtre and associates study, the mean value of PELOD score in patients with favorable outcome was 9.4, whereas in the group with lethal outcome mean scores were 31.0 PELOD (3). For both point systems, according to the literature data, values are significantly higher for the observed patients with lethal outcome. Considering the difference of our results compared to the literature data, the obtained results suggest the need for analysis on a greater number of the observed patients.

By using the ROC curve the values of the area under the curve were obtained for the Pediatric risk of mortality score (PRISM) which were 0.8306, whereas for the Pediatric logistic organ dysfunction score (PELOD) the values of area under the curve were 0.7967. These results show that by the use of PRISM and PELOD numerical system it is possible to achieve high reliability and safety is satisfying certainty in prediction of the final outcome of treatment. Both scores meet the ROC criteria for a good prediction, which means that the value of the area under the curve is higher than 0.70. A similar survey, with the help of ROC curve was carried out by A. Thurkal, where the validity of PRISM score was verified by the values of ROC curve 0.80 [24]. Singhal et associates by the determining of mortality prediction using the PRISM score received a value of discrimination with the ROC curve 0.72 which indicates a satisfactory value of prediction [25]. Moreno and associates in their multicenter study, got a discrimination value of PELOD score of 0.91 [26]. Research H. Iskandar survey gave the ROC analysis value for PELOD score of 0.954, and for the PRISM score 0.868. Both score in this study gave high values of the prediction of the final outcome of treatment [27]. Pedro Garcia and associates analysis of PELOD score in two pediatric intensive units, with its statistic results indicated a very good discrimination value for PELOD

score (ROC 0.93) [28]. Regardless of the different values of the results obtained by different researchers, it is clear that both point systems show strong reliability in the assessment of the final outcome prediction

A calibration degree was established by Hosmer-Lemeshov goodness-of-fit test. When Hosmer-Lemeshov goodnes-of-fit test (HL GOF) was applied in the prediction of a treatment outcome, based on the results of PRISM score, the values were 2.913 with the risk factor p = 0.405. Assessment of treatment outcomes based on the results PELOD score, applying this test the values of 0.609 with a risk factor p = 0.434. Leteurtre and associates in their multicenter study showed the values of PELOD score calibration using HL-HL GOF $\chi 2 = 4.03$ with the risk factor p = 0.54 [3]. V.F. Martha survey similarly suggests the use of PRISM score, because the calibration values PRISM score are $\chi 2$-HL = 9.23 with the value of p = 0.10, [29]. The analysis of PELOD score, Pedro Garcia and associates in two pediatric intensive unit, according to its statistical results indicated very poor calibration values ($\chi 2$-HL = 72.3, with risk values p lower than 0.001) [28]. Considering the difference in our results compared to literature data, where the calibration values, using HL-GOF test indicated good reliability in the prediction assessment of the final outcome of treatment with both point systems, but with slightly better results for PELOD score, the obtained results indicate the need for analysis to be carried out on a larger number of subjects. Costa and associates in their retrospective cohort study, got results in a period of one year, at a general tertiary pediatric intensive care unit. The pediatric risk of mortality score (PRISM) showed adequate discriminatory capacity and thus constitutes a useful tool for the assessment of prognosis for pediatric patients admitted to a tertiary pediatric intensive care units [29].

VI. Conclusion

The average number of hospitalized patients in Intensive Care Unit of the Pediatric Surgery Clinic, annually was 195, with an average mortality of 8.8%. The reported incidence of multiple organ dysfunction syndrome (MODS) in the intensive care unit in the study was 10%, with a mortality of 62%. Most at-risk for the development of severe sepsis were neonates.

For the total number of respondents, the median PRISM score was 10.0. The mean value of PRISM score in the group of patients with favorable outcome was 8, and with lethal results 18. The results were obtained for the mean values of PELOD score of 9.5 for the total number of respondents. In our study, the median PELOD score in the group with favorable outcome of treatment was 7.7, whereas in the group with lethal results mean was 17.7. Based on these results, it was confirmed that the higher values of the PRISM score and PELOD directly related to an unfavorable outcome. In addition, this study confirms that both scores reliably reported and described the clinical condition of patients analyzed.

Using ROC curves the values of area under the curve were obtained for the pediatric risk of mortality score (PRISM) of 0.8306, while for the pediatric logistic organ dysfunction score (PELOD) values of area under the curve 0.7967. These results indicate that the application of the PRISM and PELOD numerical system achieves high reliability and satisfactory safety in predicting the outcome of treatment.

Using Hosmer-Lemeshov goodnes-of-fit test in the assessement the outcome, based on the results of PRISM score, the values of risk factors p = .405. Assessment of treatment outcomes based on the results PELOD score, applying this test the values of the likelihood ratio p = 0.434were obtained. Results of the application Hosmer-Lemeshov goodnes-of-fit test indicate that it is possible to predict the outcome in the regression model.

The study results show that both scores, based on statistical methods of discrimination (ROC curve) and calibration (HL-GOF test) reliably show and describe the clinical condition of patients analyzed.

Daily use and use of numeric system is needed to achieve full effectiveness of the therapy. Initial assessment, daily monitoring and reliable prediction of the final outcome of the application of pediatric scoring systems allow to raise efficiency and rationalization of work in an intensive care unit.

Previous clinical trials need to be upgraded through a multi-center study, with the aim of finding, as more reliable parameters, as new scoring systems to predict the outcome of treatment for multiple organ dysfunction in the pediatric age.

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VII. Abbreviations

PELOD-Pediatric Logistics Organ Dysfunction Scoring System
PRISM- Pediatric Risk Score of Mortality
MODS- Multiple Organ Dysfunction Syndrome
ICU -Intensive Care Unit
ROC-Receiver Operating Characteristics Curve
HL-GOF- Hosmer-Lemeshow goodness of fit test
ACCP / SCCM -Association Consensus Conference Chest Physicians and Intensivists
SIRS- Systemic inflammatory response syndrome
PIRO classification (P predisposition, I for infection, R for response of organism and O for organ dysfunction)
PS- Probability of Survival
PM- Probability of Mortality
PSI -Physiologic Stability Index

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Table 1 : Pediatric risk of mortality score (PRISM II score)

PARAMETER	AGE	VALUE	POINT
Systolic pressure(mmHg)	Infant	130-160	2
		55-65	2
		> 160	6
		40-54	6
	Child	< 40	7
		150-200	2
		65-75	2
		> 200	6
		50-64	6
Diastolic pressure (mmHg)	All ages	< 50	7
		>110	6
Heart rate/min	Infant	> 160	4
		< 90	4
	Child	> 150	4
Breathing frequency/min	Infant	< 80	4
		61-90	1
		> 90	5
	Child	apnea	5
		51-70	1
		> 70	5
Pa O_2/Fi O_2	All ages	apnea	5
		200-300	2
Pa CO_2 (mmHg)	All ages	< 200	3
		51-65	1
GCS	All ages	> 65	5
Pupil reaction	All ages	< 8	6
		Unequal or dilated	4
PT/PTT	All ages	Fixed and dilated	10
Total bilirubin (μmol/l)	> 1 month	1.5 puta	2
Potassium (μmol/l)	All ages	> 3.5	6
		3.0-3.5	1
		6.5-7.5	1
		< 3.0	5
Calcium (μmol/l)	All ages	> 7.5	5
		7.0-8.0	2
		12.0-15.0	2
		< 7.0	6
Glucosa (mg/dl)	All ages	> 15.0	6
		40-60	4
		250-400	4
		< 40	8
Bicarbonates (μmol/l)	All ages	> 400	8
		< 16	3
		> 32	3

Table 2 : Paediatric logistic organ dysfunction score (PELOD score)

Points	0	1	10	20
ORGAN DYSFUNCTION				
NEUROLOGICAL				
GCS	12-15	7-11	4-6	3
and	or			
Pupil reaction	reactive	Not assessed	Both fixed	
CARDIOVASCULAR DYSFUNCTION				
Heart rate/min				
< 12 yr	= 195		>195	
= 12 yr	= 150		> 150	
Sistolic TA (mmHg)				
< 1 month	> 65		35-65	< 35
1 month-1 yr	> 75		35-75	< 35
1-12 yr	> 85		45-85	< 45
= 12 yr	> 95		55-95	< 55
RENAL DYSFUNCTION				
Creatinine (μmol/l)				
< 7 days	< 140		= 140	
7 days- 1 yr	< 55		= 55	
1-12 yr	< 100		= 100	
= 12 yr	< 140		=140	
RESPIRATORY DYSFUNCTION				
PaO_2 (kPa/FiO_2)	> 9.3 and		= 9.3 ili	
Pa CO_2 (kPa)	= 11.7 and		> 11.7	
Mehanic ventilation	Without MV	Ventilation		
HEMATOLOGY SYSTEM DYSFUNCTION				
Leukocyties (x 10^9/l)	= 4.5 and	1.5-4.4 or	< 1.5	
Platelets (x 10^9 /l)	= 35	< 35		
HEPATIČ DYSFUNCTION				
Aspartate transaminase (IU/l)	< 950 and	= 950 or		
Protrombin time (or INR)	> 60	= 60		
	(< 1.40)	(= 1.40)		

Table 3 : The probability of lethal outcome based on PRISM score using logistic regression

PRISM score	Expected outcome of the LR (number of patients)	Actual result (number of patients)
0-2 (18)	0,84	0
3-5 (20)	1,47	1
6-10 (18)	2,12	2
11-19 (16)	3,7	6
>20 (18)	9,78	9

Table 4: The probability of lethal outcome based on PELOD score using logistic regression

PELOD score	Expected outcome of the LR (number of patients)	Actual result (number of patients)
0-9 (32)	1,61	2
10 (33)	5,28	4
>11 (25)	11,09	12

Table 5 : Comparasion of tested values (PRISM and PELOD scores)

The values of tests	PRISM	PELOD
H-L GOF test x^2 (p)	2,913 (p=0,405)	0,609 (p=0,434)
Area of ROC curve-AUC (CI 95%)	0,8306	0,7967
Standard error AUC	0,062	0,066

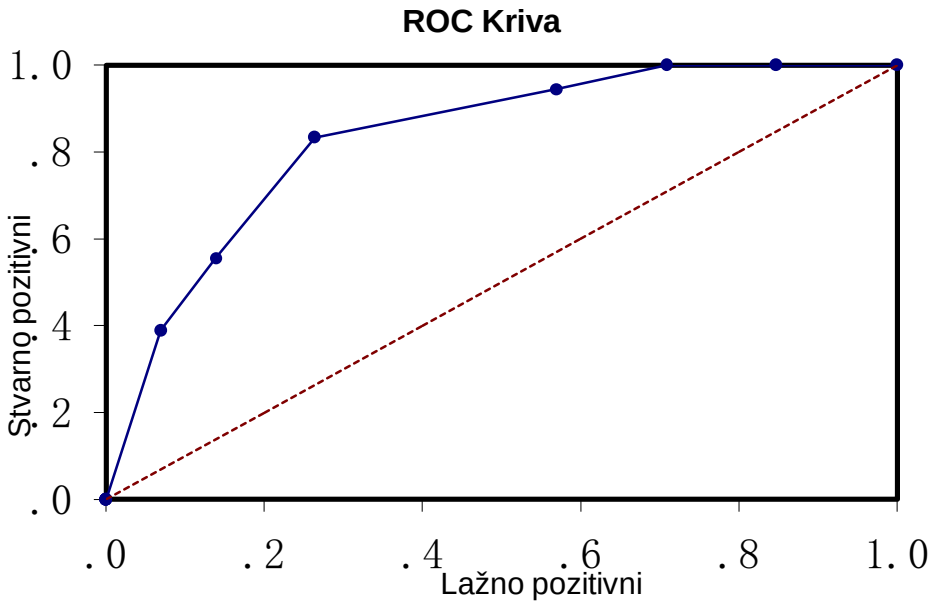

Figure 2 : Pelod score values using ROC curve

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Non-Communicable Diseases and Health Indices of Adolescents in Jamaica: A National Perspective

By Paul Andrew Bourne, Cynthia Francis, Charlene Sharpe-Pryce, Angela Hudson-Davis, Ikhalfani Solan, Olive Watson-Coleman & Joan Rhule

University of Technology, Jamaica

Abstract- *Introduction:* Of all human deaths in the world, in 2008, 63 percent are owing to non-communicable diseases (NCDs) of which 80 percent are in developing countries. In Jamaica for 2008, 50 percent of deaths occur to NCDs, especially among women and older people. The adolescence period is rarely seen for it contributory role to NCDs, which is the rationale for few research in the area among this cohort in English-speaking Caribbean. This study fills the gap in the literature by examining NCDs among adolescents.

Objectives: The objectives are to examine the adolescence period as it relates to NCDs, evaluate health indices in this period and determine the prevalance of NCDs as well as disaggregate NCDs by socio-demographic characteristics.

Keywords: *adolescents, cardiovasuclar diseases, chronic condition, developing nations, health, jamaica, lifestyle practices, non-communicable diseases.*

GJMR-F Classification : *NLMC Code: WS 200, WG 120*

Strictly as per the compliance and regulations of:

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Objectives: The objectives are to examine the adolescence period as it relates to NCDs, evaluate health indices in this period and determine the prevalance of NCDs as well as disaggregate NCDs by socio-demographic characteristics.

Materials and methods: A sample of 1,394 respondents ages 10 to 19 years from a national probability survey is used for this study. The data are taken from the Jamaica Survey of Living Conditions, which is a modification of the World Bank's Household Living Standards Survey.

Results: The prevalence rate for NCDs among adolescents in Jamaica is 2.7 percent, 7 percent report having an illness and among those with an illness, 48.7 percent have NCDs (diabetes, 4.0 percent; hypertension, 1.3; Other NCDs, 43.4 percent). Diabetes begins in middle adolescence among poor rural females and hypertension starts in late adolescent among affluent urban females.

Conclusion: The findings herein warrant public health interventions that are specialized to the sociodemographic and health realities of adolescents.

Keywords: adolescents, cardiovasuclar diseases, chronic condition, developing nations, health, jamaica, lifestyle practices, non-communicable diseases.

I. Introduction

Non-communicable diseases (NCDs) have reached an epidemic stage in developing countries. This perspective is embedded in the World Health Organization's (WHO) statistics, which show that 80 percent of NCDs are in the developing nations and that they account for 60 percent of all mortalities [1]. NCDs, therefore, singly account for most human deaths than any other happenings and this warrants public health recognition as well as interventions. On disaggregating NCDs, Unwin and Alberti [2] opine that these deaths are mostly associated with working aged people, women and that "… [the] incidences in younger adults are substantially higher in the poor countries of the world than in the rich", which concurs with the work of the WHO. There are implications of Unwin and Alberti's perspective and these include lowered production, increase medication and health care visitations for Caribbean people because of chronic noncommunicable diseases.

The Caribbean region, which is a part of developing world, subscribes to the NCDs'profile has outlined by the WHO. In fact, Hospedales et al. went further than the WHO to postulate that NCDs in the Caribbean Community (CARICOM) have the highest burden in the Americas [3]. Such a perspective supports the NCDs epidemic in the Caribbean region; warrants research in the area and provide a rationale for the many studies that have been conducted since the last decade in the region on different NCDs [3-14]. The plethora of studies on NCDs also includes one on children, which is conducted by Bourne [15]. Using national probability data for Jamaica, Bourne finds that some NCDs in children have increased by over 100 percent in a 5-year period, chief among them being diabetes [15]. While this finding offers some insights into the coverage of NCDs among Caribbean peoples, those cases would not be relating to lifestyle practices of the patients but more in keeping with biological deficiency including lifestyle practices of the mothers.

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Bourne's work [15] paints a gloomed picture of the NCDs epidemic, particularly diabetes, in children. Although NCDs is substantially an adult, woman and rural area phenomena [4, 16], reported cases among children and the percent increases in the last 5 years are astronomical in Jamaica [15]. In research of the literature, we find a research that examines health and lifestyle practices of Jamaicans ages 15-74 years. In that work, depression, diabetes mellitus, high cholesterol and obesity are synonymous with women and rural residents [14]: depression (men, 14.8 percent; women, 25.6 percent); diabetes (men, 6.4 percent; women, 9.3 percent); high cholesterol (men, 7.5 percent; women, 15.6 percent), and obesity (men, 12.3 percent; women, 37.5 percent). Among those ages 15-24 years old, 1.2 percent report having diabetes mellitus, 6.3 percent hypertension, and high cholesterol 4.0 percent and 20.4 percent notes having depression [14]. Within the context of the aforementioned studied sample, children and adolescents are excluded and mean that none, from a national perspective on Jamaican adolescents, is in the literature. However, other studies in different parts of the globe find that three quarters of adolescents who remain obese in adulthood had a high probability of developing neoplasm, diabetes and stroke [16-19]. Those studies highlight the risk factors associated with poor lifestyle practices among adolescents and how these translate into NCDs at older ages. One study went as far as to highlight the percentage of adolescents who are overweight [20] and another research indicates that they are two times more likely to develop cardiovascular diseases and seven times more likely of having atherosclerosis diseases[21]. Clearly, the prevalence of NCDs in developing countries is primarily owing to poor lifestyle practices during adolescence, which the WHO states is accounted for more than half of the cases [22].

There is a paucity of information on the prevalence of particular NCDs among adolescents in the Caribbean. In fact, the prevalence of high blood pressure among is 4.5 percent [23]; diabetes 25 percent [24]; 70 percent of obese adolescents are at risk of cardiovascular disease on or before 20 years of age [25]; 10 percent adolescents have chronic lung diseases (asthma) [26], and leukaemia is the most common malignant among European young people under 15 years (47 per 1 million) [27]. The high risk factors are well documented in the literature on NCDs in developing countries [28]; and with the previous mentioned statistics, a clear account of NCDs in developing world can be had and justifiable rationales for intervention programmes [29]. Although the Caribbean has the highest rate of NCDs in the Americas [3], the NCDs epidemic in the region extends beyond this locality to Africa [30]. It is not surprising therefore that an article is entitled Non communicable diseases: a race against time' [31]; because this is summarizes the challenges of NCDs in the developing world, especially the Caribbean. To clarify their perspective that NCDs is the highest for the Caribbean in the America, Hospedales et al. [3] opine that amputations resulting from Diabetic-related issues are the highest in Barbados compared to the rest of the world, and that diabetes is 600 percent higher in Trinidad and Tobago compared to North America, which offers a rationale for plethora of studies on NCDs in the region.

Although adolescents only constitute 20 percent of Jamaica's population [32], lifestyle practices during the adolescence period – the invincible era – accounts for most of the mortality in later life or deaths by NCDs. Statistics reveal that 65 percent of all deaths in the world in 2008 are owing to NCDs of which the majority (80 percent) are in developing countries [33, 34], indicating that the lifestyle practices of people in low-to-middle income countries during the adolescence period extent beyond individual to societal and global burdens. Although Jamaica is an English-speaking middle income developing country in the Caribbean, between 48 and 55 percent of all deaths are because of NCDs [32], especially among women and elderly people [13, 15], this does not warrant a non-research perspective on the matter from an adolescent vantage point. Health issues in the Caribbean region have focused rightfully so on teenage pregnancy, crime and violence, other reproductive health matters and substance use (or abuse) [35-40]; but the gateway period to the NCDs is left substantially unexplored. With the literature showing that the adolescence period is the gateway to the prevalence of NCDs in the developing world [34]; hence, it is fitting to study this age cohort as it relates to NCDs and health status. In an extensive search of the literature, we did not find one article that singly examined NCDs and general health of adolescents. The World Health Assembly has gone as far as to support a resolution that its members must institute measures to address issues relating to young people as it relates to NCDs [41]; yet, few studies have been published on the English-speaking Caribbean and/or Latin America region on the NCDs in the adolescence period [42-44]. Of the three articles that we identify, two are on Jamaica: The first is a cross-sectional study of 276 adolescents ages 14-19 years from grades 9 to 12 from 5 of the 14 parishes in Jamaica [42]. The purpose of the research, lead by Barrett et al, wass to examine risk factors among the respondents as it relates to Type 2 diabetes (T2D) and cardiovascular diseases (CVD).The second study used a national probability cross-sectional data on Jamaica for adolescents ages 10-19 years, aims to evaluate demographic shifts in health conditions and the typology of health conditions experienced by this age cohort [43]. The study by Baldwin et al, covered the Latin America and the Caribbean young people aged

10-24 years; but primarily focused on four NCDs that are cardiovascular disease, cancers, diabetes, and chronic respiratory diseases. Furthermore, the study assessed the population's behavioral risk factors such as tobacco usage, alcohol consumption, unhealthy diet, and lack physical inactivity [44]. The literature therefore lacks a single study that is a national probability study on NCDs and health status of adolescents aged 10-19 years. The objectives of this study are: to examine the adolescence period as it relates to NCDs; evaluate health indices in this period, and determine the prevalance of NCDs as well as disaggregate NCDs by socio-demographic characteristics.

II. Materials and Methods

On a yearly basis, the Planning Institute of Jamaica (PIOJ) and the Statistical Institute of Jamaica (STATIN), two governmental agencies, conduct national probability surveys called the Jamaica Survey of Living Conditions (JSLC), which seeks to guide policy formulations. The JSLC is cross-sectional descriptive surveys, which uses stratified random sampling techniques. It collects data on households characteristics, health, education, expenditure on durable and non-durable goods, utilities, etc), social programmes, and other information. The survey is collected using a standardized instrument (i.e., questionnaire) that on average takes approximately 45 minutes to complete by each respondent. The JSLC is modeled after the World Bank's Living Standards Measurement Study (LSMS) household survey [45]. There are some modifications to the LSMS, as JSLC is more focused on policy impacts and therefore this is reflected in the collected data.

According to the JSLC [45], the sample is weighted to reflect the population of Jamaica. The households in the JSLC are interviewed on an annual basis for a period of up to four years, after which a new representative sampling frame is redesign and drawn. A detailed presentation of the sampling techniques are in other published works [14, 15]. The data are entered, stored and retrieved in the Statistical Packages for the Social Sciences (SPSS) for Windows, Version 21.0. For this study, descriptive statistics are performed for the socio-demographic characteristics of the sample; the bivariate analyses are chi-square and analysis of variance (ANOVA). Statistical significance was determined using a p value < 5% (i.e., 95% confidence interval).

III. Definition of Variables

Health: This is defined as the self-rated health status of an individual

Good health: Is a binary variable where 1 = at least good self-rated health status and 0 = otherwise.

Age: This is the total number of years lived since birth, measured from one birthday to the next

Health-care Seeking Behavior (or visits to medical professional): This is derived from the question 'Have you sought medical attention in the last four weeks (using the survey period), where 1=yes and 0=otherwise.

Age groups: Adolescents are individuals ages 10 to 19 years old, with early adolescence being 10-12 years; middle adolescence, 13-15 years old; and late adolescence being 16+ years old.

Other NCDs: These include malignant neoplasms, ischaemic and other heart diseases, and high cholesterol.

Health Insurance Coverage: This is a binary measure, in which 1 denotes self-reported ownership of private and/or public health insurance coverage and 0 is otherwise.

Length of illness: The number of days an individual report that he/she experiences ill-health due to NCDs.

Purchased prescribed medications: This is an individual reporting that he(she) filled the prescription that he(she) received on visit to the health care practitioner(s).

Health indices: For this paper, this concept is measured using illness (or self-reported illness), health-care seeking behavior (or health care utilization), health insurance coverage, and health insurance utilization.

Non-communicable Disease (NCD): A disease that is non-infectious

Figure 1 depicts a bar graph showing percent of those with chronic noncommunicable diseases by gender of the respondents. Of those with chronic noncommunicable diseases (n=37), 62.2 (n=23) percent are females. Among the female who indicate having a chronic noncommunicable disease, 13.0 percent have diabetes, 4.4 percent have hypertension and 82.6 percent have other chronic noncommunicable conditions. All the males, on the other hand, report having other chronic noncommunicable diseases.

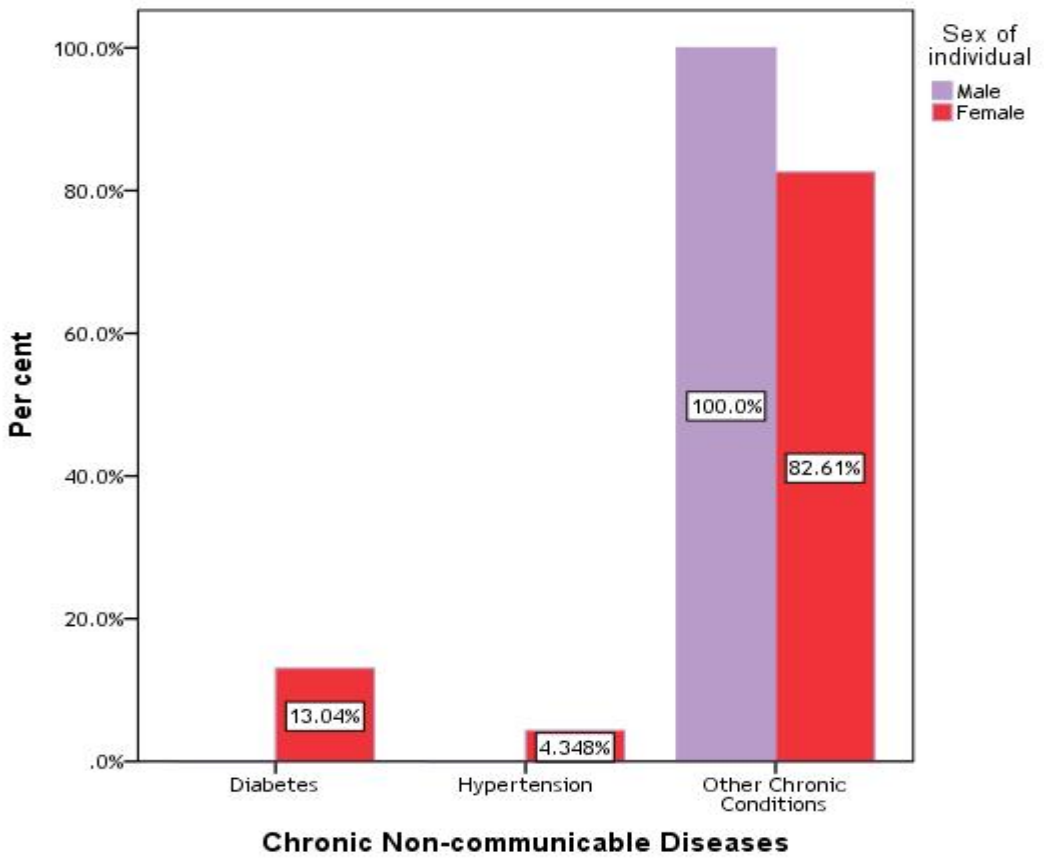

Figure 1 : Chronic non-communicable diseases by gender of respondents

Table 1 summarizes the socio-demographics of the sampled population. Marginally more of the sampled respondents are in their late adolescence (35.7 percent), 51.8 percent are females, and 51.1 percent reside in rural areas. The majority of the respondents currently live with their biological mother (76 percent) compared to 37.4 percent who reside with their biological father.

Table 1 : Socio-demographic characteristics of sampled population, n = 1, 394

Characteristics	Frequency (Percent)
Age cohort	
Early Adolescence	463 (33.2)
Middle Adolescence	433 (31.1)
Late Adolescence	498 (35.7)
Gender	
Male	672 (48.2)
Female	722 (51.8)
Area of residence	
Urban	394 (28.3)
Peri Urban	287 (20.6)
Rural	713 (51.1)
Population Income Quintile	
1	320 (23.0)
2	328 (23.5)
3	287 (20.6)
4	263 (18.9)
5	196 (14.1)
Biological parent lives in household	
Father	277 (37.4)
Mother	562 (76.0)
Received Social Assistance	
Yes	232 (17.3)
No	1108 (82.7)

Table 2 presents percent on self-reported illness, health status and non-communicable diseases of the sampled respondents. Three percent of the sampled respondents report having non-communicable conditions (NCDs). The majority of those with NCDs, report having Other conditions (43.4 percent) compared to 4.0 percent having diabetes and 1.3 percent having hypertension. In fact, none of the respondents report having arthritis (or arthritic pains).

Table 2 : Health Indices, n = 1, 394

Characteristics	Frequency (Percent)
Self-reported illness	
Yes	89 (6.6)
No	1251 (93.4)
Self-reported health status	
Very Good	631 (47.2)
Good	601 (45.0)
Fair	84 (6.3)
Poor	20 (1.5)
Self-reported Conditions	
Non-communicable diseases (NCDs)	
Diabetes	3 (4.0)
Hypertension	1 (1.3)
Others Conditions	33 (43.4)
Infectious diseases	39 (51.3)
Health Insurance Coverage	
No	1123 (85.3)
Yes	194 (14.7)
Health-Care Seeking Behavior	
No	43 (46.2)
Yes	50 (53.8)
Health Care Facility Utilization	
Private	23 (46.0)
Public	26 (53.1)

Of those who report having at least one non-communicable disease, 33.3 percent of those with diabetes are in their early adolescence compared to 33.3 percent with other conditions. Two in every three respondents with diabetes indicate purchasing the prescribed medication compared to none with Other conditions and all with hypertension. All the respondents who indicate having diabetes are females as well as those with hypertension compared to 57.6 percent of those with Other conditions (**Table 3**). However, the majoritiy of the diabetics are poor females (66.6 percent) from rural areas compared to affluent urban females who are hypertensive (100 percent). A statistical association exists between purchased prescribed medications and typology of NCDs ($P < 0.0001$), with none emerging between - age cohort and typology of NCDs ($P = 0.412$); health insurance coverage and typology of NCDs ($P=0.181$); population income quintile and typology of NCDs ($P=0.668$) and other combinations (**Table 3**).

Table 3 : Selected characteristics by typology of non-communicable diseases

Characteristics	Non-communicable diseases			χ^2, P value
	Diabetes	Hypertension	Other Condition	
Age cohort				3.953; 0.412
Early adolescence	1 (33.3)	0 (0.0)	11 (33.3)	
Middle adolescence	2 (66.7)	0 (0.0)	11 (33.3)	
Late adolescence	0 (0.0)	1 (100.0)	11 (33.3)	
Purchased Prescribed Medicine				28.052; < 0.001
No	1 (33.3)	0 (0.0)	33 (100.0)	
Yes	2 (66.7)	1 (100.0)	0 (0.0)	
Education				5.350; 0.5
No formal schooling	0 (0.0)	1 (100.0)	6 (18.2)	
Primary (or preparatory)	1 (33.3)	0 (0.0)	10 (30.3)	
Secondary	2 (66.7)	0 (0.0)	15 (45.5)	
Tertiary	0 (0.0)	0 (0.0)	2 (6.1)	
Health Insurance Coverage				3.417; 0.181
No	1 (33.3)	1 (100.0)	26 (78.8)	
Yes	2 (66.7)	0 (0.0)	7 (21.2)	
Health-Care Seeking Behavior				0.795; 0.672
No	1 (33.3)	0 (0.0)	14 (42.4)	
Yes	2 (66.7)	1 (100.0)	19 (57.6)	
Gender				2.730; 0.255
Male	0 (0.0)	0 (0.0)	14 (42.4)	
Female	3 (100.0)	1 (100.0)	19 (57.6)	
Area of residence				4.746; 0.314
Urban	0 (0.0)	1 (100.0)	11 (33.3)	
Peri-urban	0 (0.0)	0 (0.0)	5 (15.2)	
Rural	3 (100.0)	0 (0.0)	17 (51.5)	
Population Income Quintile				5.812; 0.668
1	1 (33.3)	0 (0.0)	9 (27.3)	
2	1 (33.3)	0 (0.0)	4 (12.1)	
3	0 (0.0)	0 (0.0)	5 (15.2)	
4	1 (33.3)	0 (0.0)	8 (24.2)	
5	0 (0.0)	1 (100.0)	7 (21.2)	
Self-reported health status				4.893; 0.299
At least good	1 (33.3)	0 (0.0)	21 (63.6)	
Fair	2 (66.7)	1 (100.0)	8 (24.2)	
Poor	0 (0.0)	0 (0.0)	4 (12.2)	
Utilization of health care facility				3.053; 0.217
Private	0 (0.0)	1 (100.0)	10 (52.6)	
Public	3 (100.0)	0 (0.0)	9 (47.4)	
Length of illness - mean ± SD (in days)	2.3 ± 4.0	4.0 ± 0.0	4.1 ± 5.4	F = 0.143; 0.867

SD denotes standard deviation

Table 4 depicts cross tabulations between self-reported health status and selected characteristics. The majority of those who report poor health status reside in rural areas (65 percent); among those who report at least good health status, 95 percent have Other NCDs and 4.5 percent with diabetes. Statistical relationships exist between 1) area of residence and health status ($P < 0.0001$) and 2) population income quintile and health status ($P < 0.0001$).

Table 4 : Selected characteristics by self-reported health status

Characteristics	Self-reported health status			χ^2, P value
	At least good	Fair	Poor	
Age cohort				2.009; 0.734
Early adolescence	408 (33.1)	26 (31.0)	5 (25.0)	
Middle adolescence	380 (30.8)	27 (32.1)	9 (45.0)	
Late adolescence	444 (36.0)	31 (36.9)	6 (3.0)	
Purchased Prescribed Medicine				2.022; 0.364

No	52 (98.1)	23 (92.0)	5 (100.0)	
Yes	1 (1.9)	2 (8.0)	0 (0.0)	
Education				10.745; 0.097
No formal schooling	185 (15.2)	13 (15.5)	13 (15.5)	
Primary (or preparatory)	348 (28.5)	23 (27.4)	23 (27.4)	
Secondary	654 (53.6)	41 (48.8)	41 (48.8)	
Tertiary	33 (2.7)	7 (8.3)	7 (8.3)	
Health Insurance Coverage				1.564; 0.457
No	1028 (85.1)	71 (84.5)	19 (95.0)	
Yes	180 (14.9)	13 (15.5)	1 (5.0)	
Health-Care Seeking Behavior				3.823; 0.148
No	27 (45.8)	15 (55.6)	1 (14.3)	
Yes	32 (54.2)	12 (44.4)	6 (85.7)	
Gender				5.602; 0.061
Male	610 (49.5)	31 (36.9)	8 (40.0)	
Female	622 (50.5)	53 (63.1)	12 (60.0)	
Area of residence				21.961; <0.0001
Urban	334 (27.1)	38 (45.2)	7 (35.0)	
Peri-urban	273 (22.2)	7 (8.3)	0 (0.0)	
Rural	625 (50.7)	39 (46.4)	13 (65.0)	
Population Income Quintile				29.723; <00001
1	272 (22.1)	16 (19.0)	13 (65.0)	
2	302 (24.5)	17 (20.2)	1 (5.0)	
3	257 (20.9)	23 (27.4)	1 (5.0)	
4	239 (19.4)	11 (13.1)	2 (10.0)	
5	162 (13.1)	17 (20.2)	3 (15.0)	
Chronic conditions				4.893; 0.299
Diabetes	1 (4.5)	2 (18.2)	0 (0.0)	
Hypertension	0 (0.0)	1 (9.1)	0 (0.0)	
Others	21 (95.5)	8 (72.7)	4 (100.0)	
Utilization of health care facility				2.633; 0.268
Private	13 (41.9)	8 (66.7)	2 (33.3)	
Public	18 (58.1)	4 (33.3)	4 (66.7)	
Length of illness - mean ± SD (in days)	2.7 ± 4.4	4.2 ± 6.1	3.3 ± 4.9	F = 0.915; 0.404

SD denotes standard deviation

IV. Discussion

The Caribbean region is experiencing NCDs epidemic, which have economic and preventative control burdens for their governments [3, 4, 47]. The reality is, the Caribbean region has the highest prevalence of NCDs in the Americas [3] and this has many implications for public health including cost of pubic health care expenditure and cost of programmes to address unhealthy lifestyle practices [47]. Although 63 percent of global mortality is accountable to NCDs, of which 80 percent are in low-and middle income nations [33, 34] and that fact that between 48 and 55 percent of deaths in Jamaica are among the elderly [32, 48], the adolescence period which is a gateway to the behavioural practices for increased risk factors that influence the development of NCDs must of critical importance to the Caribbean region. The rationale behind the importance of adolescence and childhood as it relates to NCDs is embedded in the statistics on the matter. In 2007, a study finds that 12 in every 100 Jamaican children ages 0 to 14 have diabetes [14], and another reveals that in 2007 over 2002, hypertension increased by 175 percent for adolescents and diabetes mellitus by 700 percent among adolescents ages 10-19 years [43]. This study goes further than all its predecessors on NCDs among adolescents and young people by revealing that 1) 3 out of every 100 Jamaican adolescents have a NCDs; 2) 4 in every 100 adolescents have diabetes; 3) 1 in every 100 adolescents has hypertension, 4) diabetes is prevalent in middle adolescent females, 5) hypertension commences at late adolescence in females, 6) those with other chronic illnesses are least likely to purchase prescribed medications (0 percent) compared to diabetic adolescents (67 percent) and hypertensive adolescents and 7) during the adolescence period only one NCDs is reported by each Jamaican adolescent. When Samuels and Fraser [46] made the call for a 'Wellness Day' that would assemble the Caribbean countries to discuss measures to prevent and control NCDs [47], the matter was fitting and even more so today, which is supported by Ferguson et al. [48] and the present study.

The present study finds that 92 percent of Jamaican adolescents report that they have at least

good health status; 7 percent have an illness and those with an illness, 48.7 percent have chronic non-communicable conditions. While the prevalence of NCDs, based on the current study, is lower than that for the adolescents (3 percent) compared to that for the population (9 percent) [46], the invincibility of this age cohort is embedded in the current health indices including the majority of them believe that they are healthy (93.2 percent) and those who sought medical care (53.8 percent). Another health index which could justify the invincibility of adolescents in Jamaica is the prevalence of mortality rate. In 2007, the overall prevalence of mortality rate in Jamaica for adolescents is 22 per 1000 deaths, which is greater for males than females (male, 26 per 1000 deaths; female, 17 per 1000 deaths) [32], such statistics illustrate that the rate of deaths among adolescents in Jamaica is relatively low and must account for the concern that probability of mortality during adolescence is small. This reality holds the key to the reckless living including unhealthy diet, high passive consumption of alcohol and cigarettes, sweetened beverages, less legumes and vegetables, with limited understand of the implications that such behavior will influence later life experiences. Adolescence is perceived as window period for reckless behavior and these will not be included in the biological timeline, and few adolescents accepts the causal relationship between their current accounts and increased risk of NCDs in later life – that is, one's actions and the associated consequences.

However, using Barrett et al.'s study [42] 33.3 percent of adolescent school pupils are overweight, and 80% of them indicate 3+ risk factors for type 2 diabetes and cardiovascular diseases. Barrett et al's work, therefore, provide a basis for interpreting the unhealthy lifestyle practices of the Jamaican adolescents as well as NCDs in later adulthood among Jamaicans. The poor lifestyle practices of Jamaican adolescents is similar to that of other countries, such as Pakistan. A study on Pakistanis adolescent school children, ages 14 to 17 years, finds that 96.9 percent have preventable risk factor for NCDS and 80+ percent have at least 2, which is in keeping with what is observed in Jamaica.

In Barrett et al's research, they find that 1) 14.5 percent of respondents are overweight, 2) 21 percent are obese, 3) 17 percent are hypertensive, 4) 1.1 percent is diabetic, 5) 39 percent are not physically active, and 6) 8 percent are pre-hypertensive. Barrett et al's work cannot be generalizable; but the current study, which is national probability cross-sectional survey, shows less hypertensive Jamaican adolescents, more diabetics and more self-reported healthy adolescents. One of the weaknesses of this study is the fact that it is a self-reported study unlike Barrett et al's work or that of Wilks et al's research [14] which tested for the conditions. Wilks and colleagues' work finds that 49.3 percent of Jamaicans ages 15-74 years are unaware that they had hypertension, 24 percent are unaware that they have diabetes and 86 percent are unaware that they have high cholesterol [14].

A part of the rationale for the discovery at the time of Wilks et al's work was that the population experienced no symptoms (or illness), which meant they had not visited a health care professional. The same thing can be said about adolescents in this study because 7 percent reported an illness and the majority indicate at least good health and therefore this would explain their unwillingness to engage in healthy lifestyle behaviors, which later account for the NCDs epidemic recorded by statistics on the Caribbean. In using statistics for Latin America and the Caribbean, Baldwin et al [45], , claimed that poor and unhealthy diet, excessive alcohol consumption, and low physical activity account for the majority of obese and overweight people who are more likely to have diabetes mellitus, hypertension and heart diseases. They went further to argue that "The region of Latin America and the Caribbean] has the most serious problem with obesity worldwide", which explains Hospedales et al.'s perspective that the Caribbean region has the highest prevalence of NCDs in the Americas [3].

The NCDs epidemic that is impacting the developing world is owing to the unhealthy behavioral practices of the population, which extend beyond the Caribbean [49]. In Pakistan, among adolescent school children, 4 out of5 practice unhealthy diets and 3 out 5 are physically inactive as well as passive smokers. Therefore, this substantiates the position of a 'Race Against Time' [50] to address the risk factor of NCDs in the developing world. The 'Race Against Time' must commence with early life origins, particularly at the early adolescence period, which holds much of the answers to NCDs in later adult life [51-54]. The NCDs epidemic in developing countries, including the English-speaking Caribbean, can be explained by Early Life Origins of Adults disease theory of which was developed by Kermack and colleagues [55] . They postulated that the decline in adult mortalities in United Kingdom and Sweden for the periods 1751 to 1930 are as a result of improvements in the conditions surrounding child health, especially living conditions of children including prenatal nutrition. When compared to the decline in adult mortalities – in the UK and Sweden, it the conclusion then that the decline in conditions in the Caribbean is what is causing the increase in the diabetes. Such a perspective, therefore, opens a better understanding for the rise in childhood diabetes seen in Jamaica for 2007 over 2002 [14]. It can also be used to explain the diabetes and other NCDs among adolescents in the early period of their lives. In the present work, we find that one-third of diabetic adolescents in Jamaica are 10 to 12 years which is the same for those with other chronic non-communicable diseases. Hypertension on the other hand, tends to take a longer time to present itself in adolescents, oftentimes showing up in their late adolescence.

In Jamaica, the current reality is, two-thirds of the diabetic adolescents are secondary school females between the ages of 13 and 15 years old. This finding shows that 67 percent of diabetic middle aged adolescents are rural poor female, with 33.3 percent living below the poverty line. Unlike the diabetic adolescents, they are urban females in their late adolescence, with 39.4 percent being poor (27.3 percent living below the poverty live. Embedded in those findings is the association between poverty and chronic conditions, which concurs with the literature [1, 56, 57], and the poor nutritional intake influencing NCDs as early as in the adolescence years. According to Wang et al. "…the well-known Dutch Winter Famine ("Hongerwinter") study, which examined long-term health outcomes of children born to mothers starved during pregnancy because of a Nazi blockage of the food supply lines during the Second World War. As adults, these children experienced significantly higher rates of type 2 diabetes and cardiovascular disease relative to their peers whose mothers had adequate nutritional intake during pregnancy" [51], which the present work shows that is occurring during the early adolescence years.

The socialized dietary practices of children and adolescents are the resultant effect of the parents'practices and these become a cost in the general society. Wilks and colleagues find that 1) 55 percent of Jamaicans ages 15-74 years consume at least a bottle or glass of sweetened beverage each day; 2) 88 percent consume pastry products at least once per day; 3) 39 percent eat fatty foods at least once per week; and 4) 46 percent are lowly physically active [13]. Inactivity in Jamaican adults is the almost the same for those adults in the Eastern Caribbean countries (46 percent) [58] and 46 percent of young males (ages 15-24 years old) compare to 72.4 percent of young females (ages 15-24 years old) have never made an effort to increase physical activity in the last year (2008). Again this underscores the correlation between adults' behaviour and those of adolescents. There is the high consumption of alcoholic beverages and cigarettes in Jamaica. Sixty-two percent of Jamaicans ages 15-74 years currently use alcohol [13]. According to Wilks and colleagues'study, current alcohol usage in 2008 is even greater when disaggregate by age cohort - among those 1) 15-24 years old, 77.5%; 2) 25-34 years old, 83.2%; and 35-44 years old, 80.0%. Cigaratte smoking is among the risk factors for chronic lung diseases as well as kidney diseases [59]; yet, it continues to be attractive to young people.

All the studies that have been reviewed on NCDs concur with each other in that overall chronic non-communicable diseases is a gendered phenomenon (i.e., females) [2, 6,8,9,12-14, 34]. Another reality which eminates from this work is the feminization of NCDs, which continues to adulthood based on postulations of the WHO that claims that 65 percent of all female deaths in the world are due to NCDs [34]. The matter of the feminization of chronic noncommunicable diseases goes back to childhood as Bourne [13] finds that more diabetic female children (ages 0-14 years) are in Jamaica and this is also the case for those who have other chronic conditions (males, 19.4 percent; females, 22.3 percent). The current findings supports the feminization of NCDs even during the adolescence years. For every 16 adolescent females, with a chronic noncommunicable disease, there are 10 males, and when the figures are disaggregated more information is revealed on the matter of NCDs by gender. More female adolescents than males report having diabetes (male, 0 percent; females, 13.0 percent) and hypertension (male, 0 percent; females, 4.3 percent) and this is reversed for those with other chronic conditions. This work concurs with the literature that female adolesents and children in the early stage of adolescence are more likely to have diabetes than males [60-63]. We went further than the literature to show that hypertension in the adolescence years is a female health condition, which start in late adolescence among urban youth. However, this work disagrees with the literature that male adolescents are more likely to have cardiovascular diseases than female adolescents. For example, 14 females to 10 adolescent males report having other NCDs including neoplasms, high cholestorol and heart diseases.. Inspite of the aforementioned results, adolescent females did not report being healthier (i.e., at least good health, 51 percent) than their male counterparts (49 percent), with P equals 0.061. Again this is based on the current study about feminization of cardiovascular conditions (males, 0 percent; females, 100 percent).

Using the prevalence rate data from this research to compared with global results some marked disparities emerge between the figures, the prevalence of hypertension is lower in Jamaican adolescents (1.3 percent) compared to those globally (4.5 percent) [22] as well as among diabetics adolescents (e.g., Jamaica, 4 percent; globe, 25%) [23], which are feminized diseases. NCDs diseases affecting women have a long history in the Caribbean, which is noted by Hagley in 1990 [63] and this continues even today among Jamaican children and adolscents. Even among older people in Jamaica, the Eastern Caribbean countries, South Africa, Cameroon and the rest of the world, NCDs are feminized phenomona [14, 34, 58, 64, 65] and the present finding shows that this emanates from the early adolescence period among rural poor. This takes the discussion into mortalities owing to NCDs by the genders to understand what obtains in the contemporary society. The present findings establish that diabetes and hypertenion are feminized phenomena during the adolescence period, other studies extend this into late adulthood and so are deaths to NCDs. In 2007, statistics show that for every 15 female that die because of diabetes there are 10 male [32]; and there are 14 female deaths to

hypertension for every 10 male deaths for the same illness [32],which goes further to support the feminization of diabetes and hypertension in Jamaica. In fact, for the periods 2006-2010, diabetes and hpertension are the second and third leading cause of death among Jamaican females, while these are the third and sixth among males respectively [32]. The issue here is, the feminization of some NCDs in the adolescence period, particularly diabetes and hypertension, continues into late adulthood and this also explains deaths to these same chronic noncommunicable diseases in later life.

V. Conclusion

Many of the unhealthy and poor lifestyle practices that high risk factors for NCDs in later adulthood starts during the adolescence period. The adolescence period among Jamaicans as it relates to NCDs are not the same as this study shows that diabetes becomes rampant during middle adolescence and hypertension is a later life phenomenon. There are mark dissimilarities, therefore, among the typology of NCDs among adolescents which is also the case for particular sociodemographic characteristics. Diabetes is a rural area poor female phenoemenon among adolescents in Jamaica, while hypertension is an affluent urban area adolescent female phenomenon. The findings would support specialized public health intervention programmes to tackle NCDs in adolescents.

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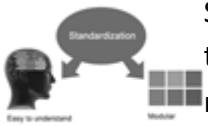

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3. Submission of Manuscripts,

4. Manuscript's Category,

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20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals Inc. (US)

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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