Abstracts of Proceedings of the African Association of Physiological Sciences (AAPS) Education Workshop, Kigali, Rwanda, December 2-4, 2018

Medical education in Africa and the fourth industrial revolution: How do we cope?

Trevor T Nyakudya

Department of Human Anatomy and Physiology, Faculty of Health Sciences, University of Johannesburg, Doornfontein, Johannesburg, 2028, South Africa. trevorn@uj.ac.za

Background and objective: The arrival of the Fourth Industrial Revolution has made the concept of digitising everything a reality. Automation, artificial intelligence, machine learning and other advanced technologies has introduced new challenges in medical education. Using tools of the Fourth Industrial Revolution to prepare future African health personnel for a rapidly changing global workforce will involve a holistic, personalized approach to education that harnesses the disruptions of the Fourth Industrial Revolution to better shape the future for the next generation and ensure that every student benefits from the ongoing transformations. This involves changing how we teach and assess our students. **Methods:** In this presentation, I will focus on the readiness of African medical educators to harness the full potential of Industry 4.0 to maximally benefit their students and trainee health personnel by suggesting ways by which we can incorporate teaching technologies in university teaching. I will make use of the pedagogical and teaching tools that I am currently employing in the Department Human Anatomy and Physiology at the University of Johannesburg to highlight the possible teaching and learning as well as assessment criteria that medical educators can potentially use to cope with the advent of the fourth industrial revolution. **Conclusion:** This strong collective narrative with authentic examples from my personal experiences and training in Health Science Education will address the hard moral, ethical and pedagogical questions facing medical education today in light of Industry 4.0.

Assessment of learning styles using the VARK questionnaire and the use of animations in teaching physiology among undergraduate medical students at Al-Neelain University Faculty of Medicine, Sudan

Tasabeeh Abd Allah Alnoor[1], Lamis AbdelGadir Kaddam [2]

[1]*Physiology lecturer, Department of human Physiology, Faculty of Medicine, Al-Neelain University, Khartoum, Sudan*
[2]*Associate professor, Department of human Physiology, Faculty of Medicine, Al-Neelain University, Khartoum, Sudan*
Email address: Lamiskaddam@hotmail.com

Background: Out of the several tools to study learning styles of students, the visual-aural-read/write-kinesthetic (VARK) questionnaire is a simple, freely available, easy to administer tool that encourages students to describe their behavior in a manner they can identify with and accept. **Objective:** The aim of this study was to understand the preferred sensory modality (or modalities) of students for learning attending physiology course. **Methodology:** This descriptive cross-sectional study was conducted at Al-Neelain public University; among the students in the second semester the first year of medical school, where 93 students who agree to participate were involved in this study. Data were collected using a questionnaire that includes the Arabic version of the standardized VARK questionnaire, along with socio-demographic variables and questions related to animation usage in physiology teaching. Ethical approval was obtained from Al-Neelain IRB and Data were analyzed using SPSS (version23). **Results:** Out of the 93 students who agreed to participate in the study 52.2% were female. The majority of students in our study had uni-modal learning style preferences (52%). The predominant sensory modality of learning was kinesthetic (49%) and aural (27%). The learning style preference was not influenced by sex. And the use of animation was generally preferred by the candidate irrespective to their learning style where (36%) of the students think that the best way to teach physiology is through animation, and 58% of the student use animation in their study for physiology with YouTube being the most common source of this animation -used by 76% of participants. **Conclusion:** These results demonstrate that students learning styles are variable. It has not been determined whether our teaching methods adequately address the different types of learners. Thus we hope these data will help when planning our course contents to make learning a more fruitful experience.

Correlation Between Some Academic Qualifications at Entry and Performance in The Pre-MBBS promotion Examination of Year Two Medical Students of Usmanu Danfodiyo University, Sokoto, Nigeria

Kasimu Ghandi Ibrahim[1], Oluwatosin Imoleayo Oyeniran [2] and Frank Babatunde Mojiminiyi[1]

[1]*Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria;* [2]*Department of Physiology, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria*

Background: In Nigeria, in addition to the Senior School Certificate Examination (SSCE), the Joint Admissions and Matriculation Board conducts the Unified Tertiary Matriculation Examination (UTME) annually for all candidates applying for admission into tertiary institutions. However, the subsequent academic performance of the students in the university does not always correlate with their qualifications at the point of admission. **Objectives:** To determine whether a correlation exists between the students' scores in the SSCE, UTME or a combination of both (CJSC) and their subsequent performance in the Pre-MBBS promotional examination. **Methods:** Data was extracted from the academic files of the students. Results of five core subjects: English, Mathematics, Physics, Chemistry and Biology were weighted and summed up to 100. The total score of the candidates in the UTME was divided by 4 to convert it to 100. The sum of the two scores (200) was taken as the CJSC. The results of the Pre-MBBS promotion examination of the candidates was also retrieved. A Pearson's correlation was used to determine association between the variables. **Results:** There was a direct correlation

between SSCE scores (r=0.31, p<0.0001), CJSC scores (r=0.25, p=0.0011) and performance in the Pre-MBBS examination. Of the students that had a raw score of ≥240 in the UTME, 68.2% failed the promotional examination. Additionally, 95.5% of the students that had a total SSCE score of ≥60 passed the promotion examination. **Conclusion:** SSCE and not UTME scores determine the subsequent performance of students in the pre-MBBS promotion examination and should therefore be given more weight during the admission process.

Innovations for large class teaching: Use of artificial urine to standardize a renal physiology practical session for online assessment

Kennedy H. Erlwanger, Vernice Peterson, Glenda Norman and Samantha Kerr

School of Physiology, Faculty of Health Sciences, University of the Witwatersrand, 7 York Rd, Parktown Johannesburg 2193, South Africa. Email: Kennedy.Erlwanger@wits.ac.za

Background: As a proactive response to the increasing numbers of undergraduate Bachelor of Science students taking Physiology as a major we needed to develop and adopt innovative teaching strategies. For renal physiology, the students have a practical on kidney function. Previously the students analyzed their own urine samples during the laboratory session. However, due to uncontrolled fluid intake prior to the practical sessions and variable hydration statuses of the students, the results obtained were extremely variable making it tedious and challenging to assess their laboratory reports. **Objectives:** To use artificial urine in order to standardize the results in order to use an electronic assessment format (multiple choice questions) rather than the traditional long lab reports for a renal physiology practical. **Methods:** Artificial urine was constituted using distilled water, food colorant and various additives to mimic different physiological and pathological states. The students used clinical urine reagent strips to analyze the artificial urine. The students were also shown a model demonstrating the filtered load and excreted quantities of various substances filtered by the kidneys. In addition the students recorded the volumes and specific gravity of what represented serial collections of urine following various 'physiological interventions'. The students analyzed the data collected during the lab session and then answered multiple choice questions related to data using an online educational software platform (SAKAI). **Results:** The preparation time for the laboratory sessions was reduced significantly. The students found the practical to be very well structured and produced consistent results between groups. The use of an electronic submission system and assessment gave the students immediate feedback on their performance. In addition the electronic nature of the assignment allowed for an item analysis for future refinement. **Conclusion:** The use of artificial urine should be considered as a standardized teaching tool for physiology laboratory sessions on renal function.

Modified Problem Based Learning MPBL: a new approach in physiology education.

Omer Abdelaziz Musa*[1] Ibrahim Abdelrhim Ali [2] Magboula Mamoun Hussein Sharif [3] Omer Alaadil A. Hamid [4] Bashir Hamad [5]

[1]Department of Physiology, Faculty of Medicine, The National Ribat University Khartoum Sudan. [2] Department of Physiology, Faculty of Medicine, The National Ribat University, Khartoum, Sudan. [3]Department of Physiology, Faculty of Medicine, International University of Africa. Khartoum. Sudan. (4) University of Africa. [5]Faculty of Medicine, International University of Africa

Background: The problems that faces the Problem-Based Learning (PBL) are: staff facilitation and availability of resources, students′ anxiety of not attaining what is required and the language. To overcome some of these difficulties PBL has been modified by performing some of the activities with the whole class and having a final discussion with the whole class in the presence of senior staff to make sure that all the objectives have been covered. **Objectives**: To apply MPBL and assess it by feedback from the students and their results in the exams. **Methods**: The first-year class in Faculty of Medicine, International University of Africa was divided into small groups and a tutor was assigned for each group. A problem about a child with edema was presented to the whole class and the students were left in the class to practice the first four jumps together under the supervision of the senior staff. Then the class small groups were asked to sit with the tutors and work out learning objectives in one hour. The students gathered in the class and with the senior staff agreed on the learning objectives required from them. The students were given two weeks to study and discuss the objectives together and with the tutor and informed that a report from each of them is needed and in the discussion any one can be asked to present whole group. Before the discussion each group was assigned to one of the objectives to prepare and present to the whole class in the presence of the staff. A questionnaire was distributed to 200 students, 171 of them responded (94 males and 77 females). **Results:** 32.2 % of the students preferred lectures and 67.8 % preferred MPBL. Those who prefer MBPL explained that because its more interesting (47.9%), easy to follow (22.9%) and contain more students participation (26%). The students′ assessment of MPBL was: 40.5 % Excellent, 32.3% very good, 20.5 % good, 6.2 % acceptable and 0.5% very bad. **Conclusion**: MPBL can tackle some problems of PBL and its overall student assessment was better than the lectures. **Key words:** Modified Problem-based learning, MPBL, Problem-based learning, PBL, lectures.

Endothelium-Independent Vasorelaxation Induced by TxA₂ Receptor Antagonist (SQ 29,548) on Rabbit Aorta

Angela Member Danborno[1,2], Paige Leigh Monnet[2,3] and James Anthony Orr[2]

[1]Department of Physiology, Faculty of Basic Medical Sciences, Bingham University, Karu, [2]Department of Molecular Biosciences, University of Kansas, Lawrence KS, 66045, [3]Truman Medical Center, University of Missouri- Kansas City, Department of OBGYN, 2301 Holmes Street, Kansas City, MO 64108. Corresponding author email: angeladanborno@yahoo.com

Background: Thromboxane A_2 (TXA$_2$) is a potent constrictor of blood vessels, and has been implicated in the pathogenesis of some cardiovascular diseases such as myocardial infarctions and hypertension. **Objective:** This study examined an intervention that can be used to displace the tight binding of U46619 to the TP receptors thereby bringing about a faster relaxation. We also examined the influence of endogenous endothelial nitric oxide (NO) on the actions of the TP receptor antagonist (SQ 29,548). **Methods:** Aortic rings were obtained from a euthanized rabbit ($n = 28$) and placed in heated organ baths and contractile responses to the thromboxane mimetic, U46619 (0.5 µM) measured. Following a maximum contraction, the U46619 solution was replaced with normal buffer and the vessels allowed to relax. **Results:** Following treatment with SQ 29,548 (3.0 µM) the aortic vessels relaxed at a significantly higher rate (0.23 ± 0.04 g/min) compared to the vehicle-treated vessels (0.03 ± 0.01 g/min) ($P < 0.0001$). We then investigated whether the displacement of U46619 and faster relaxation brought about by SQ 29,548 was dependent on the release of NO from the endothelium. **Conclusion:** Vessels treated with an inhibitor of NO production (L-NAME, 1.0 µM) or vessels where the endothelium was mechanically removed showed the same response to inhibition of contractions by U46619 as vessels treated with the vehicle of L-NAME or vessels in which the endothelium was not denuded. Focusing on strategies to speed up relaxation of a contracted vessel

adds to the significance of this work. Results from our experiments suggest that administration of SQ 29,548 may be useful in relaxing a vessel that is already contracted by a thromboxane mimetic, for example, a vessel in spasm.

Assessment of Sex Differences in the Effects of Spinal Cord Injury on Serum Lipid Profile

Basheer Waziri and Mabrouk Elkhashab
Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Bayero University, Kano, Nigeria. Correspondence: wazbash80@gmail.com.

Background: Dyslipidemia is one of the major complications following Spinal cord injury (SCI) resulting to increase risk of cardiovascular diseases. Although, there are many studies on the changes in lipid profile following SCI, information on sex differences in relation to these changes are scanty. **Objectives**: The study aimed at assessing sex differences in the changes taking place in serum HDL, LDL, Total cholesterol and Triglycerides in response to acute SCI. **Method**: 24 albino rats were divided into two groups, the SCI models and Controls, each containing equal number of males and females (n = 6) matched for age ($\geq$ 120 days) and weight (200g – 250g). The models were subjected to complete transection of spinal cord below T4 after deep anesthesia with ketamine 75mg/kg. Two weeks post SCI, blood samples were collected from the 2 groups for serum analysis. Serum lipid profiles were estimated using Randox colorimetric assay kit. Data analyzed using IBM SPSS Statistics 20.0 and results were compared using independent t test. P values < 0.05 were considered statistically significant. **Results**: Both male and female SCI models were found to have significantly lower (P = 0.01) serum HDL (12.22 $\pm$ 2.07mg/dl) compared to the controls (30.94 $\pm$ 3.96mg/dl). However, in addition to this, the male models were found to have significantly higher (P = 0.000) serum LDL (52.15 $\pm$ 3.51mg/dl) compared to the male controls (15.90 $\pm$ 4.28mg/dl) and significantly higher (P = 0.02) total cholesterol (86.32 $\pm$ 2.20) when compared to the male controls (64.87 $\pm$ 7.35mg/dl). Serum LDL and total Cholesterol in the female models were not significantly different (P > 0.05) from that of the female controls. **Conclusion**: The study found a significant increase in serum LDL and Total cholesterol related to male SCI models indicating higher risk of dyslipidemia in response to SCI.

Effects of Prolong Passive Shisha Smoking on Lipid Profile

Basheer Waziri and Aisha Jaafar
Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Bayero University, Kano, Nigeria. Correspondence: wazbash80@gmail.com.

Background: Unlike cigarette smoking, shisha (water-pipe tobacco) smoking is usually practiced in groups at cafes or restaurants thereby exposing many people to passive smoking. With the emerging evidences linking active shisha smoking with cardiovascular diseases (CVD), the risk of these diseases resulting from passive exposure to shisha smoke need to be investigated. **Objectives**: The study aimed at assessing serum HDL, LDL, Total cholesterol and triglycerides following prolong exposure to passive shisha smoking. **Method**: 12 adult Wister rats were divided into three groups (group 1; controls, group 2 and 3; exposed to passive smoking 30mins/day and 1 hour/day respectively for 8 weeks). After 8 weeks, they were anaesthetized with ketamine 60mg/kg and blood samples were collected in plane bottles for serum analysis. The lipid profiles were estimated with Randox enzymatic colorimetric assay kits using a colorimeter. Data analyzed with IBM SPSS Statistics 23.0 and results were compared using one way ANOVA and turkey post hoc test. P values < 0.05 were considered statistically significant. **Results**: Serum LDL (mg/dl), Total cholesterol (mg/dl) and triglycerides (mg/dl) were significantly higher (P < 0.05) in group 3 (LDL = 190.11 $\pm$ 14.56, cholesterol = 230.90 $\pm$ 10.15, triglycerides = 219.83 $\pm$ 12.57) and group 2 (LDL = 194.33 $\pm$ 6.82, cholesterol = 195.04 $\pm$ 3.35, triglycerides = 204.43 $\pm$ 5.76) compared to group 1 (LDL = 81.56 $\pm$ 8.01, cholesterol = 118.67 $\pm$ 8.09, triglycerides = 108.29 $\pm$ 7.05). Serum HDL (mg/dl) was significantly lower (P < 0.05) in group 3 (20.53 $\pm$ 4.01) and group 2 (28.91 $\pm$ 1.93) compared to group 1 (52.95 $\pm$ 2.79). **Conclusion**: The study found a significant increase in serum LDL, Total cholesterol and triglycerides and significant decrease in HDL following prolong passive exposure to shisha smoke in Wistar rats indicating higher risk of CVDs among passive shisha smokers.

Anti-ulcer mechanisms of l-lysine in male wistar rats.

Chukwu J. Okonkwo[1], Francis S. Oluwole[1*] and Ayobami Dare[2]
[1]Department of Physiology, College of Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria, [2]Department of Physiology, College of Health Sciences, Bingham University, Karu, Nasarawa State, Nigeria. Corresponding author: Francis S. Oluwole franwole@gmail.com*

Background: L-lysine is an essential amino acid found in most protein food sources, in particular high-protein foods such as eggs, meat, soybean, milk and fish. This amino acid has been reported to have an indirect antioxidant property. Antioxidants are known to have gastroprotective property. **Objective**: To evaluate the effect of L-lysine pre-treatment on indomethacin induced ulceration in male Wistar rats. **Methods**: Fifty male Wistar rats were used for this study and were randomly divided into two study groups of twenty five (25) animals each. The first sub-group was used for the anti-ulcer studies; antioxidant enzymes (SOD, CAT, and MDA), Nitric oxide, parietal cell count, and the mean ulcer score, while the second sub-group was used for the gastric mucus secretion study. Each sub-group was divided into five groups with five animals per group namely: Control, Omeprazole (20 mg/kg), L-lysine (100 mg/kg, 200 mg/kg and 400 mg/kg). **Results**: The results showed that l-lysine pre-treatment significantly increased SOD activity and reduced MDA levels but with no significant change in catalase activity. NO levels in the treated groups were significantly higher than in the control. Gastric mucus secretion was significantly increased and the parietal cell count significantly reduced in L-lysine pre-treated animals. **Conclusion**: The findings from this study reveal that l-lysine supplement has some anti-ulcer properties which might be mediated throu gh increased antioxidant enzymes, increase gastric mucus secretion and inhibition of parietal cell synthesis. This will be beneficial in the treatment of peptic ulcer.

Antihyperglycaemic effect of aqueous extract of *Moringa oleifera* leaf in alloxan-induced diabetic male wistar rats

Morolahun Ebenezer Abimbola, Senga Kali Pemba, Cassian Celestine Magori, Umoh Okon Idiongo
St Francis University College of Health and Allied Sciences, Ifakara, Tanzania. emorolahun@sfuchas.ac.tz

Background: Diabetes is a metabolic disease associated with impaired glucose metabolism. Management of diabetes without side effects is still a challenge for health care system. Therefore, there is an increase search for improved anti-diabetic drugs. **Objective**: To investigate antihyperglycaemic effect of aqueous extract of *Moringa oleifera* leaf in alloxan-induced diabetic male wistar rats. **Methods:** *Moringa oleifera* leaves were air-dried, grinded, sieved and aqueous extract was prepared. Fasting blood glucose, uric acid and C-reactive protein levels were measured using oxidase, Uricase-PAP and turbilatex methods respectively.
Results: Result of the research work has shown a significant increase in the blood glucose, uric acid and C-reactive protein levels in rats

that were diabetic when compared with control rats. However, treatment with 100mg/kg and 400mg/kg of aqueous extract of *Moringa oleifera* leaf for 4 weeks brought blood glucose, uric acid and C-reactive protein levels toward basal level significantly (P<0.05). **Conclusion:** The study has shown that aqueous extract of *Moringa oleifera* leaf has the potential to lower elevated blood glucose, uric acid and C-reactive protein levels toward the basal level in alloxan-induced diabetic rats. The phytochemical screening has shown the presence of some substances such as alkaloids, saponins which may be responsible for this action.

Platelet Indices in Male and Female German Shepherd Dogs in the Sudan

*Nidaa Ali Mohammed Ibrahim[1]; Shamseldein Hassaballa Ahmed[2]; Shadia Abdelatti Omer [2] and Gusai Hussen Abdel Sammad[3]

[1]*Department of Animal Physiology, College of Veterinary Medicine, University of Bahri, Khartoum, Sudan.*
[2]*Department of Basic Science, College of Veterinary Medicine ,Sudan University of Science and Technology, Khartoum, Sudan.*
[3]*Department of Microbiology, College of Veterinary Medicine, University of Bahri, Khartoum, Sudan*

Lab testing gives a valuable baseline picture of good health for the dog even in young and healthy dogs. This study evaluates the effects of sex on platelet parameters and correlations between platelets indices to find reference values for German shepherd dog reared in the Sudan. Thirty three healthy German shepherd dogs aged between 2-4 years were categorized into two sex groups (14males, 19 females) were used in this study. Five ml blood samples were taken from cephalic vein and analysis was performed using the Sysmex KX2 hematology analyzer. The data was analyzed by T test for student and spearman correlation test. The overall mean values of platelet parameter were: PLT 183.52± 59.97 (×109/L), MPV 9.19±0.96fl, PCT 0.13±0.09% and PDW15.61±0.90%. Significant (P≤0.05) sex differences were observed for platelet count and red cell distribution width between male and female. Significant (P≤0.01) correlation was found between PLT and PCT in female and all the dogs. No significant correlations between PLT and MPV, PDW in the two sexes. Moreover; significant correlations (P≤0.01) were observed between PDW and RBC, MCV and RDW in the over all. However; no significant correlations were detected between RBC and PLT, PCT and PCV in all dogs. Effect of sex should be considered in clinical interpretation of dog platelet variables. Determined reference values may be useful information for an increasing clinical use.

Seasonal Variation in Blood Constituents of German Shepherd Dogs in the Sudan

Nidaa Ali Mohammed Ibrahim[1]; *Shamseldein Hassaballa Ahmed[2] and Shadia Abdelatti Omer[2].

[1]*Department of Animal Physiology, College of Veterinary Medicine, University of Bahri, Khartoum, Sudan.*
[2]*Department of Basic Science, College of Veterinary Medicine Sudan University of Science and Technology, Khartoum ,Sudan.*

Blood maintains the physiological equilibrium in the body but physiological and environmental conditions may alter this equilibrium. So many of the hematological parameters are influenced by factors like breed, sex, age, nutrition, pregnancy and mainly by seasonal changes. This study was conducted to determine the effect of natural seasonal changes (temperature, rain fall and relative humidity) on some hematological and biochemical parameters of 19 exotic German shepherd dogs of both sexes aged between 2-4 years reared at Khartoum state during the year 2014-2015 .Blood samples was collected during winter (November, December, January and February).Summer (March,April,May and June).Autumn the rainy season (July, August ,September and October) for complete blood count and serum metabolites analysis using an automated hematology and biochemical analyzer. The monthly mean, maximum and minimum of ambient temperatures, relative humidity, and rain fall were obtained from Khartoum Meteorological Unit .The data was analyzed by ANOVA test. The results revealed that: the red blood cells count and RDW increased significantly p≤0.00 during summer. Meanwhile; MCV, MCH, PCT and neutrphil increased significantly P<0.00 during winter. While WBC, Hb, and PCV, phosphorus, cholesterol, triglyceride and mix cells (basophil, eosenophil and monocyte) were not affected by season. According to these results, it appears that the hematological profile of the German shepherd dogs reared in Sudan is subjected to seasonal variations, so it would be a factor to consider in interpreting the hematological profile in the German shepherd dogs reared in Sudan.

Oxidative stress markers in normal, overweight and obese subjects in Kaduna

Fatima Lami Ciroma [1*], Maryam Baraka Akor-Dewu[2], Musa Abubakar Kana[3]
Joseph Ojo Ayo[4], Aliyu Mohammed[2]
[1]*Department of Human Physiology, Faculty of Basic Medical Sciences, College of Medicine, Kaduna State University, Nigeria.* [2]*Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Ahmadu Bello University, Zaria, Nigeria.* [3]*Department of Community Medicine, College of Medicine, Kaduna State University, Nigeria.* [4]*Department of Physiology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.*

Background: Exposure to factors including excess body weight are reported to cause oxidative stress, which, coupled with under-production of anti-oxidant mechanisms damages cellular structures, and may result in development of obesity-related complications. Oxidative stress is known to play a role in the pathophysiology of obesity and its components. There are variations in level antioxidants across diverse populations, but data concerning antioxidants in overweight individuals is limited in Nigeria. **Objectives:** The present study aims to determine antioxidants status in normal, overweight and obese subjects in Kaduna, Nigeria. **Methods:** A total of 280 subjects (186 males and 94 females), within the ages of 18 to 76 years were recruited from a university community. Body mass index (BMI) was calculated (kg/m^2), malondialdehyde (MDA), catalase (CAT), superoxide-dismutase (SOD), and glutathione (GSH) were measured by enzymatic calorimetric methods. **Results and Conclusion:** Activity of CAT was significantly (P < 0.05) increased in obese (48.9 ± 3.19 U/mg) male subjects, while MDA concentration was significantly increased (P < 0.05) in overweight (197.2 ± 31.18 nmol/mg) female subjects. Oxidative stress markers were significantly increased in obese males and overweight females.

Blood pressure and body mass index of adolescents in Bomo, Zaria, in the years 2004 and 2018

Maryam Baraka Akor-Dewu[1], Jemila Isah[1] and Fatima Lami Ciroma[2]
[1]*Ahmadu Bello University, Zaria, Kaduna, Nigeria;* [2]*Kaduna State University, Kaduna, Nigeria*

Background: Blood pressure (BP) and body mass index (BMI) are among the vital parameters used to assess the nutritional and health status of individuals. Studies from various parts of the world have reported an alarming rise in the prevalence of overweight adolescents, with a concurrent increase in incidence of abnormal blood pressure. **Objective:** This study aims to compare BP and BMI of adolescents in Government Secondary School Bomo, Zaria in the year 2004 (Group 1) with 2018 (Group 2). **Methods**: Data on age,

gender, height, weight, BMI, and BP in 2004 was obtained from a previous study conducted on adolescents in the same school in 2004. Anthropometric indices and blood pressure of adolescents in 2018 in the same locality were measured using standardized procedures. A total of three hundred and five (305) students (141 from group 1 and 164 from group 2) participated in the study. Data were statistically analysed and values were presented as mean ± Standard deviation, student t-test was used to compare means. **Results and Conclusion:** There was a significant increase ($p < 0.05$) in all the parameters in group 2 when compared to group 1. Male adolescents in group 2 had a significant increase in all investigated parameters when compared to group 1, while females also had a significant increase ($P < 0.05$) in all the parameters excluding systolic blood pressure. In conclusion, there was a significant increase in BMI, age, and BP of adolescents in the year 2018 when compared to the year 2004.

Plasma protein reference value in apparently healthy Sudanese local breed ruminants

Iman Mustafa Hamad, [1] Elniema. A. Mustafa, [2] Adil M.A Salman,[3] Elmahadi Elmansori[4], Wael Ibrahim Mursal [5] , Abobaker M Elayis. [6]

Departments of [1]Physiology, [2]Food safety & Vet. Public Health University, [3]Preventive Medicine, [4] Microbiology, [5]Pathology & [6] Medicine, Faculty of Vet. Medicine, University of Bahri, Khartoum Sudan. E-mail: imanhamad7@gmail.com

Reference values for physiological parameters may differ considerably from standard ones, which may lead to misdiagnosis of diseases if relayed upon standard ones. The objective of this study was to determine the reference values of total protein and Albumen, in apparently healthy Sudanese local breed ruminants, and to compare these reference values obtained from cattle, sheep and goat, to the corresponding standard ones, as well as to compare between the values obtained from the three species. The study also aimed to find out if the sex difference has an effect on these values of total protein and albumen? To achieve this objective, blood samples from 90 Sudanese local breed ruminants, were collected. 30 Kinana & Asalia local breeds cattle (25 female, 5 male), 30 Hamari and Kabbashi local breeds Sheep (23 female, 7 male), & 30 Al Sahrawi local breed goat (22 female, 8 male), from middle Sudan, White Nile province - Kosti area. Total protein and Albumen were measured using Labtech digital photometer and BioSystem kits. A mean of (6.6) gm/dl of blood total protein was reported for cattle with albumen mean value of (2.8) gm/dL. For sheep, a mean value of (7.9) and (4.8) gm/dl of blood were reported for total protein and albumen successively, while mean of (7.5) gm/dl of blood total protein was reported for goat with albumen reference value of (3.4) gm/dl. It was found that Sex has no considerable effect on both total protein and albumen. The study concluded to that; the reference protein values for Sudanese local breed ruminants were not considerably different from the standard ones except for cattle which were found to be of lower values than the standard ones, and among the three species.