

The effect of Prolactin in response to academic stress during examination condition in healthy male and female University students

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Abstract: The effect of Prolactin in response to academic stress was studied in forty healthy male and female University students during their final year seminar presentation examination. The data collected are some Anthropometric parameters, Blood pressure (diastolic and systolic) and prolactin level. The arterial blood pressure was measured by auscultatory method using stethoscope and sphygmomanometer. Serum prolactin level in blood sample collected from each subject was analyzed using prolactin ELISA kit. The serum prolactin level in students under examination condition when compared to students not under examination increased significantly ($P < 0.05$). The blood pressure also increased with a significant statistical value ($P < 0.05$) when the test group was compared to the control group. It can therefore be inferred that Prolactin level increases in academic stress in both male and female may be a useful neuro-endocrine link to stress.

Keywords: Prolactin, Academic, Stress, Examination, Systolic, Diastolic, Pressure, Student

1. Introduction

Academic stress has carried a lot of attention that is why its consequences attract research at all levels in the academic circle. In the academic institutions, stress has been categorized to have both positive and negative consequences if not managed well [6]. Despite the increase in technological development and the rapid growth of information, competition among all group of people has become on the increase, as a result people become more occupied and tensed up with stress [1-2]. Although appropriate stress is a stage for self-growth and it gives people motivation for advancement in life. Nevertheless, overstress causes problems and discomfort which can have a serious consequences on people. Academic pressure is a significant source of stress for many University students [16]. A very good number of identified sources of academic-related stress have included fear of not passing coursework, time pressures, financial worries, and concern about academic ability [17]. Additionally, students report

stress over struggling to meet academic standards, time management worries, and concerns over grades. Prolactin is a polypeptide hormone synthesized and secreted by the lactotrophs [26]. Indeed, not only does prolactin sub-serve multiple roles in reproduction other than lactation, but it also plays multiple homeostatic roles in the organism by regulation of the immune system, [10] osmotic balance, [12] and angiogenesis [7]. Furthermore, we are now aware that synthesis and secretion of prolactin [23] is not restricted to the anterior pituitary gland, [9] but other organs and tissues in the body have this capability [11,13]. This study is intended to evaluate the effect of prolactin hormone in response to stressful events in the life of University students. The students are required to earn a minimum of one hundred and twenty credit units before graduation as Bachelor Science Degree (B.Sc).

2. Materials and Methodology

2.1. Materials

The following materials were used for the research work; 40 Standard bottles, 2ml pipette, Bench Centrifuge Hawksley RegNo891481 Ser. No. 07.4.26, Weighing balance H80 Gallenamp, Biorad-machine Registration number 5100, Sphygmomanometer and stethoscope, Cotton wool and disinfectant (methylated spirit), Subjects 40 healthy male and female final year B.Sc. Human Physiology students.

2.2. Data Collection

The study was compiled with the ethical committee guidelines of Ahmadu Bello University Teaching Hospital, Zaria. The procedures followed were in accord with the ethical standards of Ahmadu Bello University, Zaria, with registration number ABUTH/PGO/COMM/0038. The data of forty healthy male and female final year students in the Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University Zaria, Nigeria. The consent of all participants was sorted through questionnaire and the participants had a good medical history with an exclusion criterion of smokers, lung diseases, endocrine disorders and cardiovascular diseases. The test group was subjected to an examination condition of seminar presentation of literature review by each final year student which last for ten minutes before a panel of examiners. The data of these students in this group are then immediately collected after the seminar presentation. The control groups are students whose data were collected at the beginning of the semester after coming back from semester break. The subjects were categorized into twenty male and female students not under examination condition and twenty male and female students under examination condition. The students were further grouped into Control (ten male and ten female) and test group (ten male and ten female). The data collected from all the subjects with an age range of 23-30 years by random sampling are; age (years), weight (kg), blood pressure (mmHg), blood sample in September, 2011.

2.3. Climate of the Research Area

The research was carried out in Zaria with the following climatic conditions: mean annual rainfall 1000mm, mean annual temperature 27°C, longitude and latitude 11° 3' N, 7° 42' E, height 670m above sea level and 664km away from the sea, with a dry and wet season [19].

2.4. Prolactin Analysis

Blood sample were collected from the subjects and immediately centrifuged to obtain serum for the determination of prolactin. The analysis was conducted in the Department of Chemical Pathology Ahmadu Bello University Teaching Hospital, Shika-Zaria. The prolactin enzyme-linked immunosorbent assay (ELISA) kit

FORTRESS DIAGNOSTICS® Limited, BXE0671A UK in microplate was designed for the quantitative evaluation of prolactin. The microplate is coated with a first monoclonal antibody prolactin. Calibrators and samples are pipetted into the antibody coated microplate. During 2 hours incubation endogenous prolactin in the sample bind to the antibodies fixed on the inner surface of the wells. Non-reactive sample components are removed by a washing step. Afterwards, a second polyclonal horseradish peroxidase-labeled antibody, directed against another epitope of the prolactin molecule, was added. During 1 hour incubation, a sandwich complex consisting of the two antibodies and the prolactin is formed. An excess of enzyme conjugate was washed out. A chromogenic substrate, TMB (3,3',5,5'-Tetra-Methyl-Benzidine), was added to all the wells. During 30 minutes incubation, the substrate was converted to a colored end product (blue) by the fixed enzyme. Enzyme reaction was stopped by dispensing of hydrochloric acid as stop solution. The color intensity is direct proportional to the concentration of prolactin present in the sample. The optical density of the color solution is measured with a microplate reader at 450 nm. A standard curve was obtained by plotting the concentration of the standard versus the absorbance. The PRL concentration of the specimens and controls run concurrently with standards were calculated from standard curve. The lowest detectable level of prolactin [8] with this test was 0.8 ng/mL.

2.5. Data Analysis

All data are expressed as mean \pm standard of error mean (Mean \pm S.E.M.). The data obtained were analyzed using t-test student-Newman Keul's test, SPSS package version 20.0 and post hoc test for multiple comparisons. The ($P < 0.05$) was accepted as significant.

3. Results and Discussion

Table 1. Students grouped into non examination condition and examination condition

Parameters	Body Weights (Kg)	Systolic BP (mmHg)	Diastolic BP (mmHg)	Prolactin Level (ng/ml)
Students grouping				
Non exam condition	58.6 \pm 2.5	114 \pm 2.2	65 \pm 1.4	14.21 \pm 0.4
Exam condition	56.6 \pm 3.2 ^{NS}	118 \pm 1.9 ^S	78 \pm 3.1 ^S	17.73 \pm 0.5 ^S

Not significant= NS; Significant=S ($P < 0.05$)

Table 2. Students grouped into sub-groups of male and female control and test groups

Parameters	Prolactin Level (ng/ml)	
	Male students	Female students
Students grouping		
Non exam condition	14.09 \pm 0.7	14.32 \pm 0.4
Exam condition	16.97 \pm 0.9 ^S	18.50 \pm 0.5 ^S

Significant=S ($P < 0.05$)

The results of students grouped into non examination condition and examination condition are shown in table 1. The blood pressure (diastolic and systolic) of the students under examination condition increased significantly ($P < 0.05$) when compared to the students not under examination condition. Prolactin level of students under examination condition increased significantly ($P < 0.05$) when compared to students not under examination. In the sub-groupings, prolactin in male students under examination condition increased significantly ($P < 0.05$) when compared to male students not under examination. Also in female sub-groupings, prolactin in female students under examination condition increased significantly ($P < 0.05$) when compared to female students not under examination as shown in table 2.

4. Prolactin Response to Academic Stress

The result of the present study showed that the prolactin level of students under examination when compared to the prolactin level of students that are not under examination condition increased significantly. This shows that academic stress may likely be one of the stressors responsible for the increase of prolactin level. Stressful conditions may usually lead to changes in serum level of many hormones [25]. There is evidence that stress influences prolactin secretion in animals and humans [20]. However various situations and laboratory stressors can induce a significant increase in prolactin secretion [18]. The multiple roles and sources of prolactin may give the hormone the versatile function on many biological actions in which its secretion in response to stress could be one [12, 24]. Although, over years we know that prolactin have numerous separate biological actions. Indeed, not only does prolactin sub-serve multiple roles in reproduction other than lactation, but it also plays numerous homeostatic roles in the organism [4]. Furthermore, we are now aware that synthesis and secretion of prolactin is not restricted to the anterior pituitary gland, but other organs and tissues in the body have this capability. When an animal or human is exposed to any enormous variety of deleterious or potentially lethal stimuli, there is an increased secretion of ACTH, which as a result, leads to rise in the circulating glucocorticoid level [14]. Although, the rationale of an elevated circulating glucocorticoid level is essential for resisting stress remains for the most part unknown. Academic pressure is a significant source of stress for many college students [16]. Identified sources of academic-related stress have included fear of falling behind with coursework, finding the motivation to study, time pressures, financial worries, and concern about academic ability [28]. Additionally, students report stress over struggling to meet academic standards, time management worries, and concerns over grades [22]. These sources may exist easily throughout the span of college students' academic careers and may result in college students'

experiencing a great deal of stress during their college career [21]. The fact that certain individuals might not habituate to chronic psychogenic stressful stimuli, their behavioral responses [5, 27] to stress may lead them to different neuro-endocrine [3] responses. This might explain the individual differences observed in the impact of stress on physical and psychological well-being. Prolactin could become an essential tool in studying the physio-pathologic [14] implications of certain behavioral patterns because of its versatile biological roles and also a valuable neuro-endocrine [15] connection of the individual response to stress.

5. Conclusion

Academic stress may likely be one of the stressors responsible for the increase of prolactin level. Prolactin could become an essential tool in studying the physio-pathologic implications of certain behavioral patterns because of its versatile biological roles and also a valuable neuro-endocrine connection of the individual response to stress.

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