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Evaluation of plasma levels of interleukin 6 and iron status based on sleeping patterns of students in a Nigerian University

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Abstract

Sleeping is so important for the vitality of human life. The study was done to evaluate levels of interleukin 6 and iron based on different sleeping patterns of students of Madonna University, Elele, Rivers State, Nigeria. The project is a cross-sectional study involving subjects recruited from students of Madonna University Nigeria, Elele Campus. A total number of 100 subjects were recruited for the study (50 males and 50 females) of apparently healthy students from Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. They all gave consent to participate in this study. The data obtained from the study were presented as Mean \pm SD in tables and analysed using student t-test and ANOVA for parametric data using SPSS version 20. The level of significance was set at $p < 0.05$. The results showed no significant change in interleukin 6 and iron levels when compared among the groups and within the groups. The study revealed that different sleeping pattern has no significant changes in the levels of interleukin 6 and iron of the students of Madonna University, Elele Campus, Rivers State.

Keywords: interleukin 6, iron, sleeping patterns, students

1. Introduction

Sleep is a natural human process for resting for daily activities and regenerating cells in the body. Sleep is a reversible process that is important for the effective functioning of the entire system. It is well known that students skip sleep to study in order to meet their academic needs. Students spend a lot of time reading books, doing homework, and attending clinical posts, especially for medical and health science students. Progressive loss of sleep quality and sleep deprivation and fatigue dissatisfaction¹⁻³, and poor sleep quality increase the risk of death⁴. Poor sleep quality is also associated with elevated IL-6 levels in patients with clinical sleep disorders⁵ and experimental studies in healthy volunteers⁶⁻⁸.

After a negative iron balance in the body due to reasons such as chronic blood loss, increased iron requirements, or malabsorption, hemoglobin synthesis is compensated by mobilizing iron from stores so that iron stores are adequate. If you don't release iron, you develop iron deficiency anemia (IDA). As in our country, iron deficiency is the leading cause of anemia worldwide, being more common in women than in men^{9, 10}. More than 30% of hospital visitors in developed countries are anemic is known, and this proportion is much higher in developing countries. Sleep is a time of physiological, cyclical and reversible changes in consciousness and behavior¹¹. It is defined as a reversible state of temporary, partial, and periodic loss of interaction between the organism and its environment¹⁰. Almost 30-33% of society has significant sleep problems. This ratio is higher in the elderly, those with mental disabilities, and certain groups with learning disabilities¹²⁻¹⁵.

The study was done to evaluate the levels of interleukin 6 and iron based on different sleeping patterns of students of Madonna University, Elele, Rivers State, Nigeria.

2. Materials and Methods

2.1 Study Design

The project is a cross-sectional study involving subjects recruited from students of Madonna

University Nigeria, Elele Campus. The subjects encompass males and females who are apparently healthy individuals, age and sex-matched. The study is a quantitative research to assess the levels of interleukin 6 and iron status of the students of the University, Elele based on different patterns of sleeping.

2.2 Study area

The research was carried at Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. It is located in the South-South part of Nigeria.

2.3 Study population

A total number of 100 subjects were recruited for the study (50 males and 50 females) of apparently healthy students from Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. They all gave consent to participate in this study.

2.4 Inclusion criteria

Students of Madonna University Nigeria, Elele Campus without any sign of any disease were selected for the study.

2.5 Exclusion criteria

Any Student of Madonna University Nigeria, Elele Campus that is sick or showed any sign of disease, pregnant, smoker, alcoholics or aged were excluded for the study.

2.6 Procurement of iron

A commercially prepared serum iron test kit product of BioSystems reagents and instruments company limited were used to assay the iron level.

2.7 Ethical consideration

The approval for the study was obtained from the Department of Medical Laboratory Science, Madonna University Nigeria, Elele Campus, Rivers State and written consents obtained from the subjects before commencement of the blood collection.

2.8 Interleukin 6 (IL-6) determination using Elabscience (Catalog No: E-EL-H0102)

Procedure

100µL standard or sample was added to the wells and incubated for 90 min at 37°C. The liquid was discarded, immediately added 100µL Biotinylated Detection Ab working solution to each well and incubated for 60 min at 37°C. The plate was aspirated and washed for 3 times. 100µL HRP conjugate working solution was added, incubated for 30 min at 37°C and aspirated and washed the

plate for 5 times. 90µL Substrate Reagent was added and incubated for 15 min at 37°C. 50µL Stop Solution was added. The plate was read at 450nm immediately and the results calculated.

2.9 Statistical analysis

The data obtained from the study were presented as Mean \pm SD in tables and analysed using student t-test and ANOVA for parametric data using SPSS version 20. The level of significance was set at $p < 0.05$.

3. Results

Table 1: Mean \pm SD values of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns

Parameters	3 hours	4 hours	5 hours	8 hours	F-value	P-value
IL-6 (pg/ml)	17.94 \pm 7.46	12.64 \pm 0.74	15.23 \pm 0.66	17.52 \pm 8.51	0.167	0.915
Iron (ug/dl)	84.67 \pm 16.25	93.87 \pm 24.82	85.60 \pm 2.12	67.65 \pm 11.67	0.876	0.504

Table 1 showed no significant change in interleukin 6 (0.915) and iron levels (0.504) of the students based on sleeping patterns as 3 hours (17.94 \pm 7.46, 84.67 \pm 16.25, 4 hours (12.64 \pm 0.74,

93.87 \pm 24.82), 5 hours (15.23 \pm 0.66, 85.60 \pm 2.12) and 8 hours (17.52 \pm 8.51, 67.65 \pm 11.67) respectively.

Table 2: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 3 hours and 4 hours

Parameters	3 hours	4 hours	P-value
IL-6 (pg/ml)	17.94 \pm 7.46	12.64 \pm 0.74	0.912
Iron (ug/dl)	84.67 \pm 16.25	93.87 \pm 24.82	0.918

Table 2 showed no significant change in interleukin 6 (0.912) and iron level (0.918) of the students based on the sleeping patterns among 3

hours (17.94 \pm 7.46, 84.67 \pm 16.25) and 4 hours (12.64 \pm 0.74, 93.87 \pm 24.82) respectively.

Table 3: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 3 hours and 5 hours

Parameters	3 hours	5 hours	P-value
IL-6 (pg/ml)	17.94 \pm 7.46	15.23 \pm 0.66	0.990
Iron (ug/dl)	84.67 \pm 16.25	85.60 \pm 2.12	1.000

Table 3 showed no significant change in interleukin 6 (0.990) and iron level (1.000) of the students based on the sleeping patterns among 3

hours (17.94 \pm 7.46, 84.67 \pm 16.25) and 5 hours (15.23 \pm 0.66, 85.60 \pm 2.12) respectively.

Table 4: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 3 hours and 8 hours

Parameters	3 hours	8 hours	P-value
IL-6 (pg/ml)	17.94±7.46	17.52±8.51	1.000
Iron (ug/dl)	84.67±16.25	67.65±11.67	0.731

Table 4 showed no significant change in interleukin 6 (1.000) and iron level (0.731) of the students based on the sleeping patterns among 3

hours (17.94±7.46, 84.67±16.25) and 8 hours (17.52±8.51, 67.65±11.67) respectively.

Table 5: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 4 hours and 5 hours

Parameters	4 hours	5 hours	P-value
IL-6 (pg/ml)	12.64±0.74	15.23±0.66	0.991
Iron (ug/dl)	93.87±24.82	85.60±2.12	0.954

Table 5 showed no significant change in interleukin 6 (0.991) and iron level (0.954) of the students based on the sleeping patterns among 4

hours (12.64±0.74, 93.87±24.82) and 5 hours (15.23±0.66, 85.60±2.12) respectively.

Table 6: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 4 hours and 8 hours

Parameters	4 hours	8 hours	P-value
IL-6 (pg/ml)	12.64±0.74	17.52±8.51	0.948
Iron (ug/dl)	93.87±24.82	67.65±11.67	0.438

Table 6 showed no significant change in interleukin 6 (0.948) and iron level (0.438) of the students based on the sleeping patterns among 4

hours (12.64±0.74, 93.87±24.82) and 8 hours (17.52±8.51, 67.65±11.67) respectively.

Table 7: Comparison of interleukin 6 (IL-6) and Iron status of students based on sleeping patterns of 5 hours and 8 hours

Parameters	5 hours	8 hours	P-value
IL-6 (pg/ml)	15.23±0.66	17.52±8.51	0.995
Iron (ug/dl)	85.60±2.12	67.65±11.67	0.751

Table 7 showed no significant change in interleukin 6 (0.995) and iron level (0.751) of the students based on the sleeping patterns among 5

hours (15.23±0.66, 85.60±2.12) and 8 hours (17.52±8.51, 67.65±11.67) respectively.

4. Discussion

The study showed no significant changes in the levels of interleukin 6 and serum iron of the students when compared among the groups and when compared within the groups. This shows that different sleeping patterns due to reading in the school environment under normal conditions have no significant changes in the students. Interleukin 6 (IL-6) is known as the cytokine that regulates the levels of iron through hepcidin. Progressive loss of sleep quality and sleep deprivation and fatigue dissatisfaction¹⁻³, and poor sleep quality increase the risk of death⁴. Poor sleep quality is also associated with elevated IL-6 levels in patients with clinical sleep disorders⁵ and experimental studies⁶⁻⁸ of healthy volunteers.

After a negative iron balance in the body due to chronic blood loss, increased iron requirements, poor absorption, etc., hemoglobin synthesis is compensated by mobilizing iron from the reservoir, and the iron reservoir provides sufficient iron. If not released, iron deficiency anemia (IDA) develops. As in our country, iron deficiency is the leading cause of anemia worldwide and is more common in women than in men^{9,10}.

The study showed no significant changes in the iron status of the subjects studied when compared within the groups and among the groups. More than 30% of hospital visitors in developed countries are anemic, and this rate is much higher in developing countries. Sleep is a period of physiological, cyclical, and reversible changes in consciousness and behavior¹¹. It is defined as a reversible state in which there is a temporary, partial, or periodic loss of interaction between the organism and its environment¹⁰. Almost 30-33% of society has significant sleep problems. This ratio is higher in the elderly, those with mental disabilities, and certain groups with learning disabilities¹²⁻¹⁵.

4.2 Conclusion

The study revealed that different sleeping pattern has no significant changes in the levels of

interleukin 6 and iron of the students of Madonna University, Elele Campus, Rivers State.

4.3 Recommendations

Interleukin 6 is known as pleiotropic cytokine with regulatory effect to hepcidin and in turn the iron status of individuals. The levels of interleukin 6 and iron status should be regulated with level of stress and sleeping hours to properly regulate the level of iron to avoid anaemia which can affect mental capacity of the students. Also some acute reactants should be checked alongside with interleukin 6 and iron levels to have optimum wellbeing of the subjects.

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