Melatonin involvement in syncope associated with sleep disturbance: A case report

Abstract

Background: Syncope or fainting associated with sleep disturbance is mostly diagnosed as vasovagal syncope and has also been linked to orthostatic or postural hypotension. The physiological basis of syncope associated with sleep disturbance is not fully elucidated. In this report a rare case of melatonin involvement in syncope associated with sleep disturbance was presented.

Case presentation: A case of a 21-year-old female with syncope associated with sleep disturbance was examined with 1 hour post syncope melatonin concentration of 33pg/ml daytime evaluation which is on the increase when compared to its female referenced average value (10pg/ml daytime evaluation). Some vital physiological variable associated with syncope like heart rate, blood pressure, hemoglobin concentration and packed cell volume were normal compared to referenced value (Table 1 and Table 2).

Conclusion: Considering the evaluations presented, it is suggested that melatonin could be involved in the sleep disturbance induced syncope and this report has created de novo insight that will aid elucidation, diagnoses and intervention of syncope induced by sleep disturbance or obstruction.

Keywords: syncope, sleep disturbance, melatonin, orthostatic hypotension, vasovagal syncope

Background

Syncope associated with sleep disturbance mostly diagnosed as vasovagal syncope [1] describes a fainting that occur when there is sudden drop in heart rate or blood pressure resulting to decrease in blood and oxygen supply to the brain. [2, 3] This phenomenon has also been linked to orthostatic hypotension (postural hypotension); a form of low blood pressure that occurs when an individual changes from lying down position to sitting or standing up. [4, 5] In many cases including syncope associated with sleep disturbance, physiological basis for sudden drop in blood pressure and heart rate when standing or sitting up is not fully explained.

Melatonin is a hormone of sleep induction; [6] It was hypothesized that melatonin could play a role in the presented case of syncope induced by sleep disturbance. Hence melatonin concentration of the patient was evaluated considering its reported input on sleep, blood pressure and blood cell indices. Although there are reports on syncope associated with sleep disturbance, [7] there is no reported case of sleep disturbance induced syncope associated with melatonin; hence this is the first reported case of its kind and this knowledge will aid to elucidate certain aspect of the physiological basis of syncope induced by sleep disturbance as well as form basis for its diagnoses and treatment.

Case presentation

During a lecture delivery to Gregory University, Uturu 300 level medicine and surgery class on the role of melatonin on sleep, a case of a 21-year-old female from Yoruba tribe of Nigeria with syncope associated with sleep disturbance was presented. According to the students, the phenomenon is recurrent and was always managed by basic first aid approach in the hostel; the subject also stated that the occurrence was noticed since childhood (at 6-years-old) and no previous medical examination has been done as basic first aid approach has always aided her recovery.

One (1) hour post syncope examination was carried out following the syncope occurrence at noon (days after the case was presented). Possible physiological variables associated with syncope such as blood pressure, heart rate, temperature, hemoglobin concentration, packed cell volume and melatonin concentration were determined (Table 1) to diagnose and ascertain the probable cause of the phenomenon. Considering the increase in melatonin concentration observed (Table 1), it was suggested that the syncope induced by sleep disturbance could be linked to serum melatonin level. Furthermore serum melatonin concentrations were performed 24hours and 48hours (daytime and peak night) post syncope phenomenon to compare the various melatonin levels with reference values (Table 2) as well as ascertain the association between serum melatonin concentration and sleep disturbance induced syncope.

Although the subject did not notice any warning signs before fainting and no medical history was documented prior to this time; basic first aid as was described by [8, 9] was the intervention measure employed.

Table 1: One (1) hour post syncope examination

S/N	Tests	Test value	Reference value (normal)	Remarks
1.	Blood pressure (mmHg)	115/85	100/70 - 120/80	Normal
2.	Heart rate (bpm)	62	60 - 100	Normal
3.	Temperature (^{0}C)	35.2	36.1 - 37.2	Slightly decreased
4.	Hemoglobin concentration (g/dl)	14	11.6 – 15.4	Normal
5.	Packed cell volume (%)	42	35.5 - 44.9	Normal
6.	Melatonin concentration (pg/ml) daytime evaluation	33	9.5 – 10.5	Increased

Table 2: Melatonin concentration (pg/ml) 1hr, 24hrs and 48hrs post syncope examination

S/N	Periods of post syncope examination	1hr	24hrs	48hrs	Reference value (normal)
1.	Daytime (at 11am)	33.0	15.5	10.8	9.5 -10.5 (10)
2.	Peak night time (at 11pm)	69.9	68.4	65.7	50.5 - 69.4 (60)
3.	Other physiological variable	normal	normal	normal	See Table 1.

*Other physiological variables: heart rate, blood pressure, temperature, hemoglobin concentration, packed cell volume.

Discussion

Melatonin is a hormone that induces sleep; sleep disturbance induced syncope has been linked to sudden drop in heart rate or blood pressure resulting to decrease in blood and oxygen supply to the brain. [1, 5, 6] In this case, 1 hour post syncope showed normal heart rate, blood pressure, hemoglobin concentration and packed cell volume (Table 1) which suggests that the syncope was not as a result of the blood pressure, heart rate and blood indices of the subject.

The major variation observed was increased serum melatonin concentration (Table 1 and 2), thus it was hypothesized that the syncope could be associated with the impact of melatonin. Follow-up examination of the subject 24hrs and 48hrs after syncope phenomenon showed a corresponding recovery decrease in melatonin (Table 2); this could be a confirmatory to our hypothesis.

To elucidate melatonin involvement in syncope associated with sleep disturbance, reports on the input of melatonin on variable associated with syncope in addition to the observation from the case reported were considered; exogenous melatonin was reported to decrease blood pressure, heart rate and cause hypothermia [10-12] which are synonymous features of sleep disturbance induced syncope;[7] hence melatonin is suggested to play role on sudden drop in blood pressure and heart rate when standing or sitting up immediately after sleep which leads to syncope, since melatonin concentration was reported to be increased in this case.

Conclusion

Considering the finding from this case report, it is suggested that the increase in melatonin concentration may have contributed to the syncope induced by sleep disturbance; since its concentration could be high after sleep obstruction and reports has shown its impact on

physiological variables that could be linked to the phenomenon. Thus, this study has created an insight to elucidate certain aspect of sleep disturbance induced syncope forming basis for intervention of such phenomenon.

Ethical Approval

Ethical clearance is not needed in the institution to report an anonymous case report

References

1. Jardine DL, Davis J, Frampton CM, Wieling W. Sleep syncope: a prospective cohort study. Clinical Autonomic Research. 2022; 32(1):19-27.
2. Kinsella SM, Tuckey JP. Perioperative bradycardia and asystole: relationship to vasovagal syncope and the Bezold–Jarisch reflex. British Journal of Anaesthesia. 2001; 86(6):859-68.
3. Hainsworth R. Pathophysiology of syncope. Clinical Autonomic Research. 2004; 14(1):i18-24.
4. Hajjar I. Postural blood pressure changes and orthostatic hypotension in the elderly patient. Drugs & aging. 2005; 22(1):55-68.
5. Nwazue VC, Raj SR. Confounders of vasovagal syncope: orthostatic hypotension. Cardiology clinics. 2013; 31(1):89-100.
6. Geoffroy PA, Franchi JA, Lopez R, Schroder CM. The use of melatonin in adult psychiatric disorders: expert recommendations by the French institute of medical research on sleep (SFRMS). L'encephale. 2019; 45(5):413-23.

7. Gilchrist PT, Provini F. Sleep syncope: a new clinical entity or just a vasovagal syncope during wakefulness after sleep onset?. Clinical Autonomic Research. 2022; 11:1-2.

8. Nwosu NC, Onwuka OM, Chukwu JAO. Awareness, Knowledge of First Aid and First Emergency Behavioral Perception of Medical Students in a University in Southeastern Nigeria. 2022; 20(9): 67-73

9. Yunus P, Damansyah H, Talib NM, Karim AR, Djarumia F, Mutoneng O. Knowledge Level of Adolescent Red Cross Students in First Aid for Syncope Handling. Journal La Medihealtico. 2022; 3(1):66-71.

10. Anghel L, Baroiu L, Popazu CR, Pătraș D, Fotea S, Nechifor A, Ciubara A, Nechita L, Mușat CL, Stefanopol IA, Tatu AL. Benefits and adverse events of melatonin use in the elderly. Experimental and Therapeutic Medicine. 2022; 23(3):1-8.

11. Cai H, Wang XP, Yang GY. Sleep disorders in stroke: an update on management. Aging and disease. 2021; 12(2):570.

12. Shelton AR, Malow B. Neurodevelopmental disorders commonly presenting with sleep disturbances. Neurotherapeutics. 2021; 18(1):156-69.