

Correlation of Neck Circumference with Cognitive and Sensory Impairment among people in selected villages of Bhubaneswar

Arunima Patra, Post Graduate Student, Department of Medical-Surgical Nursing- Critical care Nursing, SUM Nursing College, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India.

Sasmita Das, Professor, Department of Medical-Surgical Nursing, SUM Nursing College, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India; Email- das.sasmita2@gmail.com (Corresponding author)

Neethu Maria Joseph, Assistant Professor, Department of Medical-Surgical Nursing- Critical care Nursing, SUM Nursing College, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India.

Abstract: *Cognitive and sensory impairment is part of the normal physiologic processes in the elderly. The risk factors associated with cognitive and sensory impairment are obesity, diabetes mellitus, hypertension. For the basic screening of a person, anthropometric measurements such as height, weight, BMI, weight circumference, waist-hip ratio are used. Neck circumference is a simple measurement that has been associated with cardiovascular risk factors. In this cross-sectional study conducted in a rural area in Bhubaneswar, neck circumference of adults in the age group of 30 – 45 years and 46 – 70 years were assessed. Cognitive impairment was assessed using Mini-mental status examination and sensory impairment was assessed using the modified ASPQ-Short Version. The majority of the participants with cognitive and sensory impairment were females. In the age group of 46 – 70 years, cognitive and sensory impairment was 22% and 26% respectively. There was a significant difference in the neck circumference in both the age groups with and without cognitive and/ or sensory impairment ($p < 0.05$). There was no relationship between neck circumference with cognitive impairment ($p = 0.406$, $p = 0.944$) and sensory impairment ($p = 0.763$, $p = 0.719$). The study was concluded with the recommendation that neck circumference can be used as a tool to screen the level of cognition and sensory output of an individual.*

Keywords: Neck Circumference; Cognitive and Sensory Impairment; cross-sectional study

Introduction

In India, the percentage of elderly persons is increasing and it is expected the percentage will increase to 15% by the year 2050. ⁽¹⁾ Old age is associated with multiple health problems including a decline in sensory and cognitive functions. This can limit a person's ability to perform everyday tasks and can affect their quality of life and ability to interact with the surrounding world.

Cognitive impairment is seen mainly among the elderly, in persons after 60 years of age. Research conducted in varying regions of the world has shown that cognitive impairment has a prevalence of 26%, 32.4% in India, Northern China respectively. ^(2,3) Cognitive impairment includes a decline in memory, perception, attention, psychomotor abilities, and executive functions like decision making, reasoning and problem-solving. ⁽⁴⁾ Diabetes mellitus, high blood pressure and obesity have a significant effect on brain and cognition. ^(5,6) Sensory functions such as hearing, smelling, touch sensation, taste, and vision also undergo age-related physiologic changes. Older adults experience

progressive hearing loss ⁽⁷⁾, decline in olfaction and taste ⁽⁸⁾, increase in tactile and pain thresholds ⁽⁹⁾, and loss of vision mainly due to age-related macular degeneration, glaucoma, cataract and diabetic retinopathy. ⁽¹⁰⁾ There is a rising need for all health care professionals to recognize cognitive and sensory impairment in those for whom they provide care through basic screening.

Anthropometric measurements such as body mass index (BMI), waist circumference, hip circumference, waist to hip ratio, waist-height ratio indicates a positive association with cardiovascular risk factors, diabetes mellitus and hypertension. ^(11,12) Besides, cognitive impairment can be predicted by height, weight, body mass index, waist circumference. ⁽¹³⁻¹⁵⁾ Neck circumference, a measure of upper body fat distribution is found to be associated with diabetes, hypertension, metabolic syndrome, and cardiovascular parameters. ⁽¹⁶⁾

Materials and methods:

A correlational research design was used. The study was conducted in a village in Bhubaneswar, Odisha. A total of 200 participants were selected purposively and grouped into two according to their age group – 102 adults within the age group of 30 – 45 years and 98 adults within the age group of 46 – 70 years.

Sample size was estimated using the following formula: $N = (z^2 \times p \times q) / e^2$

Where, z = level of confidence for standard normal distribution = 1.96

p = proportion of sample with the desired characteristics = 0.15

q = (1 – p) = 0.85

e = tolerable error = 0.05

The calculated sample size was N = 196. Thus, the researchers had decided to take a total of 200 samples.

The flow diagram in Figure 1 presents the sample selected in each group.

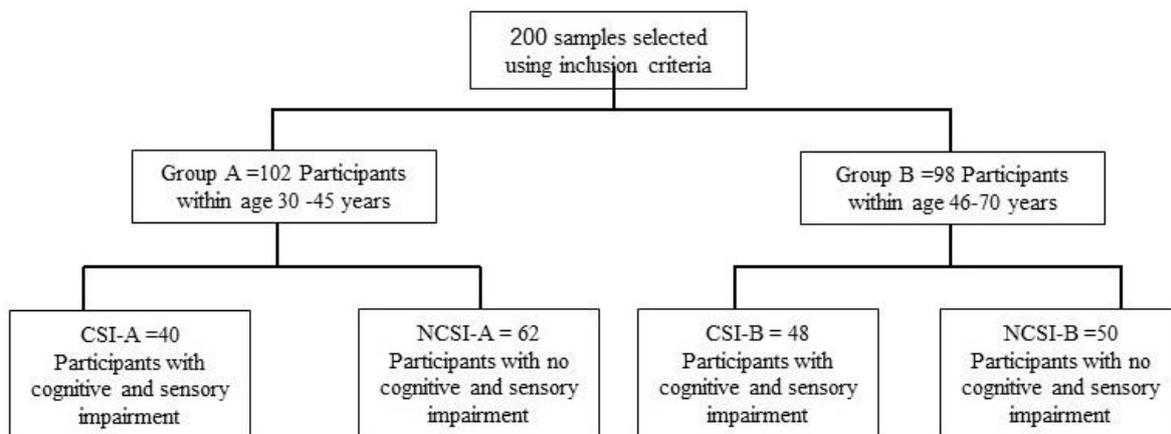


Figure 1: Schematic presentation of the selection of samples in both the age groups.

The selected adults were literate and able to understand Oriya/ English language. Persons who were suffering from dementia, any diagnosed psychiatric disorders, thyroid or spinal cord diseases or those receiving palliative treatment were excluded from the study.

Socio-demographic data which included age, gender, education, occupation, monthly income and marital status, medical and surgical problems were assessed. Cognitive impairment was assessed using Mini-Mental Status Examination (MMSE) and sensory impairment was assessed by modifying the Adult Sensory Perception Quotient (ASPQ) – Short Version. ASPQ-Short version(17) is a 35 item questionnaire that measures hypersensitivity and hyposensitivity to stimuli was developed in the UK and thus, some of the questions were modified as per the Indian culture and tradition. The tool was then validated and internal consistency was measured using Chronbach’s alpha and it was found to be

0.71. Neck circumference was measured by placing a calibrated plastic measuring tape just below the larynx (or in the middle of the neck) and extending the tape around the neck. The cut-off value for neck circumference was set at 36.55 cm for males and 34.05 cm for females. ⁽¹⁸⁾

Results:

Statistical analysis was done using SPSS version 20 for analysis of the collected data. Each of the two groups was further divided into two groups according to the presence or absence of cognitive and/ or sensory impairment.

After MMSE, mild and moderate cognitive impairment was found to be 28% and 22% in 30-45 years and 46 – 70 years group respectively. Sensory impairment was 12% and 26% in 30-45 years and 46 – 70 years group respectively. Among the participants in the age group of 30 – 45 years, 39% had cognitive and/ or sensory impairment (CSI-A group) and remaining had no cognitive and/ or sensory impairment (NCSI-A group). In the age group of 46 – 70 years. 49% had cognitive and/ or sensory impairment (CSI-B group) and remaining had no cognitive and/ or sensory impairment (NCSI-B group).

Among the participants in the groups with cognitive and sensory impairment, 57% and 67% were females in CSI-A and CSI-B group respectively.

Neck circumference of the participants revealed that 22% in CSI-A and 29% in CSI-B group crossed the cut-off value and had high neck circumference. Furthermore, there was a significant difference in the neck circumference in both the age groups with and without cognitive and/ or sensory impairment ($p < 0.05$) as shown in Table 1.

Table 1: Comparison of neck circumference between the groups with and without cognitive and/ or sensory impairment

Neck circumference	Mean±SD	Std error	df	t-value	p-value
CSI-A	36.2±1.348	0.36	100	-2.99	0.003*
NCSI-A	34.2±2.311	0.24			
CSI-B	35.1±2.309	0.41	96	-1.99	0.04*
NCSI-B	34.1±2.47	0.30			

* ≤ 0.05 - statistically significant

There was no significant relationship between neck circumference with cognitive and sensory impairment in both the age groups at 0.05 level of significance as given in table 2.

Table 2: Relationship between neck circumference with cognitive impairment and sensory impairment

Group	Variables	r value	p-value	Variables	r value	p-value
CSI-A	Neck circumference and cognitive impairment	0.343	0.406	Neck circumference and sensory impairment	0.159	0.763
CSI-B	Neck circumference and cognitive impairment	0.017	0.944	Neck circumference and sensory impairment	0.111	0.719

Discussion

In this study, females had a higher percentage of the prevalence of cognitive impairment. Among the studies conducted in different regions in India, cognitive impairment was positively associated with female gender. ^(19,20)

Mild and moderate cognitive impairment was found to be 22% among the age group with 46 – 70 in the present study. But a study conducted by Godbole S, Godbole G and Vaidya S showed that 76% of participants had an MMSE score <23 i.e. had cognitive impairment. ⁽²¹⁾ Onwuekwe I O conducted a study among adults with a wider age range, that is, 16 – 76 years and found that only 5.93% of participants with impaired cognition. ⁽²²⁾

Sensory impairment among adults in the 46 – 70 year age group in the present study was 26%. Visual, auditory and olfaction has been measured separately in the previous studies. Schubert C R et al. showed that 50% had hearing impairment, 24% had an olfactory impairment and 3% had visual impairment. ⁽²³⁾

This study revealed that there was a statistically significant difference in the neck circumference in the groups with and without cognitive and/ or sensory impairment ($p < 0.05$). But, there was no significant relationship between neck circumference with cognitive or sensory impairment. Few studies explore the relationship between neck circumference and cognitive impairment. Chen J et al in a recent study observed that there was a significant positive association of high neck circumference with cognitive impairment. ⁽²⁴⁾

The present study has certain limitations which include a small sample size of the adults with cognitive or sensory impairment due to which the study findings cannot be generalized to a larger population. Cognitive impairment was assessed solely with the use of MMSE and no clinical assessment was performed. More research studies on a similar topic should be taken up to be added to the information reserve.

Conclusion

From the result of the study it was concluded that the people with cognitive and sensory impairment are having a high value of neck circumference but there is no significant relationship was found between neck circumference and cognitive impairment and neck circumference and sensory impairment. Hence it may be recommended that neck circumference is simple, convenient and easy which can be a useful indicator to detect the cognitive and sensory impairment besides other anthropometric measurements.

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Ethical Permission: Approved

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