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CERVICAL SPONDYLOSIS AS A RISK FACTOR ON THE INCREASED LIKELIHOOD OF POSTERIOR CEREBRAL VASCULAR ACCIDENT

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ABSTRACT

Background: Cervical spondylosis refers to degenerative changes in the cervical spine, often beginning in the intervertebral discs, resulting in bony protrusions that affect adjacent soft tissues. Cervical spondylitis can also compress the vertebral arteries externally, especially when the head is rotated and extended. This makes it an extrinsic factor that later leads to posterior circulation infarction. **Objectives:** To evaluate the role of cervical spondylosis as a risk factor for posterior cerebrovascular accident. **Methods:** The study design is a case-control, it was conducted at Basra Teaching Hospital and Al-Salam and Ibn Sina Teaching Hospitals in Mosul. The questionnaire was divided into five sections: the first section covered sociodemographic factors, the second section covered the patients past medical history, the third section covered the patients past surgical history, the fourth section covered details of cervical spondylitis, and the fifth section covered radiographic findings. Patients with renal or hepatic impairment, those under the age of 18, and patients with insufficient data or who did not consent to share their data were excluded from the study. Ultimately, 60 patients were enrolled in the study and divided into two groups (cases with posterior stroke and a control group without posterior stroke), each comprising 30 patients. **Results:** The study included 35 males and 25 females. The mean age of the participants ± standard deviation was 59.29 ± 11.76 years. A significant association with posterior stroke and a statistically significant difference between the two groups were found regarding the presence of cervical spondylitis (odds ratio = 3.763), duration of cervical spondylitis (odds ratio = 1.322), presence of cervical spondylosis-related neurological deficit (odds ratio = 3.110), and presence of previous cerebrovascular events (odds ratio = 2.666). No significant association or difference was observed regarding the presence of cervical spine injury or surgery. In addition, there was a statistically significant difference between patients with and without cervical spondylitis with respect to age ($P < 0.001$), residence ($P = 0.004$), occupation ($P < 0.001$), illiteracy level ($P < 0.001$), family history of cervical spondylitis ($P < 0.001$), overweight and obesity ($P < 0.001$), diabetes ($P < 0.001$), hypertension ($P < 0.001$) and smoking ($P < 0.001$). **Conclusions:** Cervical spondylosis is a risk factor for posterior circulation stroke, but this stroke may be unexpected. Other risk factors found in this study include male gender, advanced age, rural residence, illiteracy, overweight and obesity, diabetes, high blood pressure, and smoking. Creating an awareness campaign on posterior circulation stroke prevention and emphasizing the need for regular cervical spine screening is crucial to reducing these risk factors.

KEYWORDS: Cervical spondylosis, Iraq, Posterior, Risk, Stroke.

1. INTRODUCTION

The term "cervical spondylosis" refers to degenerative changes in the cervical spine that frequently begin in the intervertebral discs, resulting in osteophytes and impacting adjacent soft tissue structures. Cervical spondylosis can also compress the vertebral arteries externally, especially when the head is rotated and extended. This makes it an extrinsic factor that causes vertebral artery stenosis, which leads to posterior circulation infarcts (POCI) or vertebrobasilar insufficiency (VBI). "Bow hunter's syndrome," also known as "bow hunter's stroke" or "rotational vertebral artery occlusion syndrome," are the terms used to describe POCI or VBI that present as head rotation within the normal physiological range.[1-3] Compression of a vertebral artery induced by cervical osteophytes may result in vertigo since the blood supply of the vestibulocochlear organs is the terminal artery of the vertebrobasilar system and it is vulnerable to compression-induced injury.[4]

All of the structures of the cervical spine, including the ligamenta flava, facet joints, Luschka joints, intervertebral discs, and laminae, can be impacted by cervical spondylosis. It is a common aspect of aging and is experienced by the majority of people after their fifth decade of life. In cases when the spinal cord, spinal vasculature and nerve roots are compressed, the degrading process can lead to incapacitating clinical problems such as myelopathy, radiculopathy, and neck discomfort, even though it frequently does not produce clinical symptoms.[5]

Quarter of people under forty and half of those of more than forty years age had cervical spondylosis. Moreover; eight-five of people older than 60 years had significant degenerative alterations were observed at one or more levels in asymptomatic persons. Ninety-five percent of men and seventy percent of women between the ages of 60 and 65 were impacted. Degeneration is most frequently founded at C5-6, C6-7, and C4-5.[6]

Cervical spondylosis may develop as a result of repeated occupational injuries. Higher prevalence was founded among dancers and gymnasts as well as individuals carrying massive loads. Congenital bone abnormalities, obstructed vertebrae and deformed laminae that put excessive strain on nearby intervertebral discs are the causes of cervical spondylosis in about 10% of individuals. Serious spinal trauma as well as certain sports like rugby, soccer, and horseback riding can all speed up the disease process and produce early-onset cervical spondylosis.[7]

The aim of this study was to evaluate the role of cervical spondylosis as a risk factor for posterior cerebrovascular accident.

2. PATIENT AND METHOD

The study was with permission from the University of Basrah, College of Medicine. Approval was also obtained from the Directorate of Health in Basrah and Mosul in addition to the Administration of the Basrah Teaching Hospital, Al Salam Teaching hospital and Ibn Sena Teaching hospital. They were informed about the nature and scope of the study. All participants themselves or their closed relatives for those with difficult speaking, were interviewed by the investigator to explain the objectives of the study and to obtain consent before data collection. The collection of data will be kept confidential and will not be divulged except for study purposes. To achieve the objectives of the present study, an observational, descriptive, hospital-based, case-control study was conducted. Modified questionnaire was used to assess the role of cervical spondylosis as a risk factor for increased risk of posterior cerebral vascular accident. Data was collected over eighteen months, from the 1st of March 2024 to the 30th of August 2025. Sixty participants were enrolled in this study: 30 were cases, and 30 were controls. Patients who are able to give informed consent and those having a registration file with a proven diagnosis of posterior CVA by neurologist were included in the study. While those with renal impairment due to contrast contra-indication, patients with hepatic impairment due to contrast contra-indication, patients who passed during the time of data collection and those who unable or unwilling to give informed consent were excluded from the study.

The data was collected using a specifically designed questionnaire this study investigated potential risk factors for posterior cerebrovascular accident, including age of 18 years and older, gender, educational level, marital state, occupation, residency whether urban or rural, data of cervical spondylosis, data of posterior cerebrovascular diagnosis, the presence of any neurological deficits associated with cervical spondylosis, previous cerebrovascular events, history of cervical spine injury or surgery, presence of diabetes mellitus based on random blood sugar reading more than 200 mg/dl with signs and symptoms of DM or fasting blood sugar more than 126 mg/dl or HbA1c more than 6.5 depending on WHO diabetes mellitus criteria of diagnosis, or being under treatment with anti-diabetic medications and the duration of diabetes since diagnosis,[8] the presence of systemic hypertension was defined as systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg,[9] or being under treatment with anti-hypertensive medications, BMI that classifies adults' fat based on their height and weight into categories such as underweight, normal weight, overweight, and obesity grades. It uses a simple equation: weight (kilograms) divided by height squared (meters)[10], smoking status, alcohol consumption, family history of cervical spondylosis and whether the patient was received treatment for cervical spondylosis or not. Radiological assessment of cervical spondylosis was done by X-ray, MRI and CT angiography.

The data collected during the study were summarized in sheets of Microsoft Excel version 2016. The statistical analysis was performed by using IBM-SPSS version 26. The normality of these data was evaluated by the Shapiro-Wilk test, and the parametric tests were decided to be used. The Chi-square test was used to find the difference between the categorical variables for contingency and more than two by two tables. Fissure exact test for two groups of nominal data when any cell was present with an expected value less than 5. Bonferroni correction was estimated to find the real significance among the groups (The Bonferroni correction is used to reduce the chances of obtaining false-positive results (type I errors) when multiple pair tests are performed on a single set of data, the probability of identifying at least one significant result due to chance increases as more hypotheses are tested, Bonferroni corrected/adjusted p-value, was estimated by dividing the original a-value (0.05) by the number of analysis on the dependent variable.). A p-value <0.05 is considered significant.

The study includes 68 subjects, 5 of them were excluded due to inability to attend CT-angiography and another 3 were unfortunately passed before the procedure. The final enrolled patients were 60 subjects, divided into two groups (cases with posterior CVA and controls without posterior CVA) with 30 subjects in each group. Thirty-five of the study participants were males and twenty-five were females. The mean age ± standard deviation of the study participants was 59.29 ± 11.76 years. Moreover; the mean age ± standard deviation of the case group was 63.52 years while the mean age ± standard deviation of the control group was 55.04 years. With regard to the case group, the majority of patients had posterior cerebrovascular accident within less than 1 year then decreased gradually till it reached those of 4 to less than 5 years. As shown in figure 3.1.

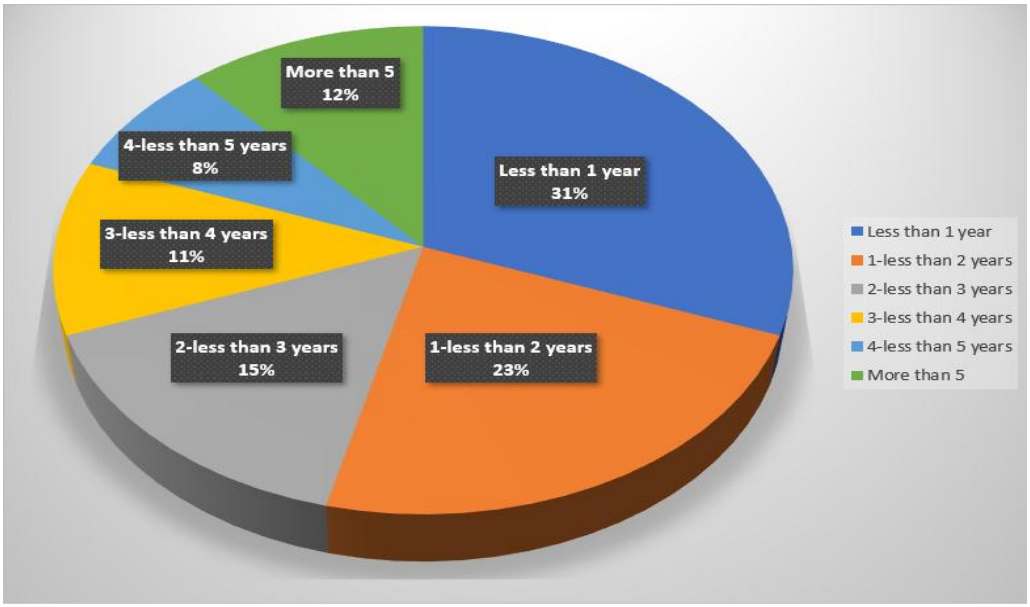

Figure 3.1: Distribution of the case group according to the duration of posterior cerebrovascular accident.

Table 3.1 shows comparison between cases and controls regarding their sociodemographic information. It's evident that risky association for posterior CVA and statistically significant difference between the two groups regarding their gender, ages and residence. While no significant association and difference between the two groups regarding their marital state, occupation and family history of cervical spondylosis. Of note, risky association for posterior CVA for illiterate educational level between with no significant difference between the two groups.

Table 3.1: Comparison between cases and controls regarding their sociodemographic information. (number=60)

Variable	Cases = 30		Controls = 30		Odds ratio (confidence interval)	P-value
	No.	%	No.	%		
Gender:						
-Male	20	66.67%	15	50%	**2 (1.141-2.789)**	**0.014**
-Female	10	33.33%	15	50%	Referent	
Age:						
-Less than 50	4	13.33%	12	40%	Referent	**0.041**
-More than 50	26	86.67%	18	60%	**4.333 (2.389-6.288)**	
Residence:						
- Urban	13	43.33%	19	63.33%	Referent	**0.007**

- Rural	17	56.67%	11	36.67%	**2.258 (1.489-2.921)**	
Marital state:						
-Married	29	96.67%	28	93.34%	Referent	
-Widow	1	3.33%	1	3.33%	1	0.796
-Single	0	0%	0%	0%	---	
-Divorce	0	0%	1	3.33%	---	
Occupation:						
-Employee	3	10%	5	16.67%	0.444 (0.084-1.032)	
-Worker	6	20%	6	20%	Referent	0.158
-Retired	14	46.67%	10	33.33%	1.75 (0.749-2.479)	
-House wife	7	23.33%	9	30%	0.333 (0.119-1.123)	
Educational level:						
-Illiterate	2	6.67%	1	3.34%	**2.25 (1.121-2.892)**	
-Primary school	9	30%	10	33.33%	1.012 (0.401-1.312)	0.687
-Secondary school	11	36.67%	10	33.33%	1.237 (0.819-1.303)	
-Higher education	8	26.67%	9	30%	Referent	
Presence of family history of cervical spondylosis.						
- Yes	6	20%	5	16.67%	1.25 (0.627-1.469)	0.584
- No	24	80%	25	83.33%	Referent	

Table 3.2 shows comparison between cases and controls regarding their anthropometric information. Risky association for having posterior CVA and statistically significant difference between the two groups regarding their body mass index.

Table 3.2: Comparison between cases and controls regarding their anthropometric information. (number=60)

Variable	Cases = 30		Controls = 30		Odds ratio (confidence interval)	P-value
	No.	%	No.	%		
Patient body mass index:						
- Under weight	0	0%	1	3.33%	---	
- Healthy weight	7	23.33%	12	40%	Referent	**0.003**
- Over weight	12	40%	12	40%	1	
- Obese	11	36.67%	5	16.67%	**2.052 (1.379-2.878)**	

Table 3.3 shows comparison between cases and controls regarding their clinical features. Risky association for having posterior CVA and statistically significant between the two groups regarding their presence of cervical spondylosis, duration of cervical spondylosis, presence of neurological deficit associated with cervical spondylosis, and presence of previous cerebrovascular events. While no significant association and difference with regard to the presence of cervical spine injury or surgery.

Table 3.3: Comparison between cases and controls regarding their clinical features. (number=60)

Variable	Cases = 30		Controls = 30		Odds ratio (confidence interval)	P-value
	No.	%	No.	%		
Presence of cervical spondylosis:						
- Yes	26	86.67%	11	36.67%	**3.763 (1.567-5.371)**	**<0.001**
- No	4	13.33%	19	63.33%	Referent	
Duration of cervical spondylosis:						
Less than 1 year	2	7.69%	3	27.27%	0.222 (0.072-1.029)	
1-2 years	3	11.54%	2	18.18%	0.5 (0.131-1.321)	
2-3 years	6	23.08%	2	18.18%	Referent	
3-4 years	7	26.93%	2	18.18%	1.166 (0.889-2.669)	**<0.001**
More than 5 years	8	30.76%	2	18.18%	**1.332 (1.007-1.739)**	
Presence of neurological deficit associated with cervical spondylosis:						
-Yes	14	53.84%	3	27.27%	**3.110 (1.538-4.897)**	**<0.001**
-No	12	46.16%	8	72.73%	Referent	

Presence of previous cerebrovascular events:						
-Yes	12	40%	6	20%	**2.666 (1.302-3.990)**	
-No	18	60%	24	80%	Referent	**0.003**
Presence of cervical spine injury or surgery:						
-Yes	1	3.33%	0	0%	---	0.312
-No	29	96.67%	30	100%		

Table 3.4 shows comparison between cases and controls regarding their medical history. Risky association for having posterior CVA and statistically significant difference between the two groups regarding the presence of diabetes mellitus, hypertension, active and passive smoking. Of note no significant association for x-smoking.

Table 3.4: Comparison between cases and controls regarding their medical history. (number=60)

Variable	Cases = 30		Controls = 30		Odds ratio (confidence interval)	P-value
	No.	%	No.	%		
Diabetes mellitus:						
-Present	16	53.33%	9	30%	**2.666 (1.678-3.721)**	**<0.001**
-Absent	14	46.67%	21	70%	Referent	
Hypertension:						
- High	18	60%	11	36.67%	**2.590 (1.489-3.839)**	**<0.001**
- Normal	12	40%	19	63.33%	Referent	
Smoking state:						
- Active smoking	13	43.33%	8	26.67%	**4.875 (2.728-7.318)**	**<0.001**
- Passive smoking	11	36.67%	8	26.67%	**4.125 (2.528-6.728)**	
- X-smoker	3	10%	5	16.67%	**1.799 (0.267-3.665)**	
- Not smoker	3	10%	9	30%	Referent	

Table 3.5 shows comparison between the cases and controls regarding their radiological findings. Statistically significant difference found between the two groups regarding the presence of positive x-ray for cervical spondylosis and MRI findings for cervical spondylosis.

Table 3.5: Comparison between the cases and controls regarding their radiological findings. (number=60)

Variable	Cases = 30	Controls = 30	P-value
	No. (%)	No. (%)	
Presence of x-ray positive findings for cervical spondylosis:			
-Yes	26 (86.33%)	11 (36.67%)	**<0.001**
-No	4 (13.67%)	19 (63.33%)	
Presence of MRI positive findings for cervical spondylosis:			
-Yes	26 (86.33%)	15 (50%)	**<0.001**
-No	4 (13.67%)	15 (50%)	

Table 3.6 shows comparison between cases and controls regarding the presence of positive vertebral artery compression detected by CT-angiography. Only patients with positive MRI findings for cervical spondylosis were sent for CT-angiography. Statistically significant difference between the two group regarding this issue.

Table 3.6: Comparison between the cases and controls regarding their CT-angiography for vertebral artery compression.

Variable	Cases = 26	Controls = 15	P-value
	No. (%)	No. (%)	
Presence of CT-angiography positive findings for vertebral artery compression:			
-Yes	10 (38.46%)*	3 (20%)	**0.024**
-No	16 (61.54%)	12 (80%)	

*Out of 10, 2 patients had herniated disc compression.

Table 3.7 shows comparison between subjects with cervical spondylosis and those with no cervical spondylosis regarding their different variables. Statistically significant difference between them regarding their age, residence, occupation, educational level, presence of family history of cervical spondylosis, presence of overweight and obesity, presence of diabetes mellitus, presence of hypertension and smoking state. While no statistically significant difference between the two groups regarding gender and marital state.

Table 3.7: Comparison between subjects with cervical spondylosis and those with no cervical spondylosis regarding their different variables. (number=60)

Variable	Subjects with cervical spondylosis = 37	subjects with no cervical spondylosis= 23	P-value
	No. (%)	No. (%)	
Gender:			
-Male	23 (62.16%)	12 (52.17%)	0.153
-Female	14 (37.84%)	11 (47.83%)	
Age:			
-Less than 50	4 (10.82%)	12 (52.17%)	**<0.001**
-More than 50	33 (89.18%)	11 (47.83%)	
Residence:			
- Urban	17 (45.95%)	15 (65.21%)	**0.004**
- Rural	20 (54.05%)	8 (34.79%)	
Marital state:			
-Married	35 (94.60%)	22 (95.65%)	0.516
-Widow	1 (2.70%)	1 (4.35%)	
-Single	0 (0%)	0 (0%)	
-Divorce	1 (2.70%)	0 (0%)	
Occupation:			
-Employee	5 (13.51%)	3 (13.04%)	**<0.001**
-Worker	11 (29.73%)	1 (4.35%)	
-Retired	7 (18.92%)	17 (73.92%)	
-House wife	14 (37.84%)	2 (8.69%)	
Educational level:			
-Illiterate	3 (8.11%)	0 (0%)	**<0.001**
-Primary school	14 (37.84%)	5 (21.74%)	
-Secondary school	14 (37.84%)	7 (30.43%)	
-Higher education	6 (16.21%)	11 (47.82%)	
Presence of family history of cervical spondylosis:			
- Yes	9 (24.32%)	2 (8.69%)	**<0.001**
- No	28 (75.68%)	21 (91.31%)	
Presence of overweight and obesity:			
- Yes	30 (81.08%)	10 (43.37%)	**<0.001**
- No	7 (18.92%)	13 (56.63%)	
Diabetes mellitus:			
-Present	19 (51.36%)	6 (26.08%)	**<0.001**
-Absent	18 (48.64%)	17 (73.92%)	
Hypertension:			
- Normal	11 (29.72%)	18 (78.26%)	**<0.001**
- High	26 (70.28%)	5 (21.74%)	
Smoking state:			
- Active smoking	18 (48.65%)	3 (13.04%)	**<0.001**
- Passive smoking	12 (32.44%)	7 (30.43%)	
- X-smoker	4 (10.81%)	4 (17.39%)	
- Not smoker	3 (8.10%)	9 (39.14%)	

4- DISCUSSION

The study shown that cervical spondylosis is a significant risk factor for posterior circulation infarct (POCI), However other factors including male gender, age of more than 50 years, rural residence, illiterate education, obesity, prolonged duration of cervical spondylosis, presence of other neurological or previous CVA with cervical spondylosis, presence of diabetes, hypertension, active or passive and even x-smoking can be risky for having POCI. This is means good clinician need to be aware that cervical spondylosis is not just a cause of pain, radiculopathy, or myelopathy but also a

risk factor for POCI and by identifying and managing these risk factors, stroke can be prevented in a lot of patients.

Regarding the natural history of the posterior CVA, the study found that the majority of patients presented within less than 1 year where there's a high rate of acute neurological symptoms that lead to medical attention within a year, but these symptoms tend to improve over time, due to resolution or adaptation. This emphasizes the need for intensive early treatment and intervention to prevent a stroke from happening again. Comparably, Markus et al who studied the treatment and preventive options of posterior CVA, he found that stroke in general had a high risk of early recurrent, particularly in the first few weeks necessitating more visiting.[11]

In this study, there were 35 male subjects and 25 female subjects, making a total of 60 participants, distributed into two groups (cases and controls groups): The case group consists of 30 patients who have experienced a stroke affecting the posterior part of the brain, while the control group includes 30 individuals who didn't had such an event.

The average age of the cases group was 63.5 years. Which is comparable to a study in Bosnia and Herzegovina found that the mean age for posterior circulation stroke was 63.5 years.[12] Another study conducted in Saudi Arabia found the mean age was 60.9 years for the entire cohort of posterior circulation stroke patients.[13] And with study conducted in China of noted a mean age was 59 years for those with posterior stroke.[14] Moreover; the study found that patients aged more than 50 years were risky for having posterior circulation stroke consistently to other studies' findings.[15-16] This increased risk is linked to age-related conditions like vertebral artery tortuosity and other degenerative changes leading to vertebral artery stenosis that located in the bony tunnel at cervical region, which are more common in middle-aged and elderly individuals and can lead to restricted blood flow.

Male gender found in this study to be risky for POCI, which runs with many studies.[17-19] However; this is might due to the presence of other confounders which more prevalent among males like smoking, and daily alcohol drinking.

Rural residence is another risk factor found in this study; this is in agreement with Kapral et al study's finding.[20] limited access to the medical services and exposure to certain environmental factors or lifestyle differences could also play a role in this result.

Illiteracy as well shown in the current study to be risky, comparably to Zhang et al. study finding.[21] As illiterate people usually have difficulty in understanding their symptoms or communicating them effectively to healthcare providers, leading to misdiagnosis or delayed care of their serious symptoms.

On the other hand; our study found that there is no specific marital state associated to POCI. There is no study to compare such finding. However, studying the marital status and stroke risk tend to focus on how marital transitions impact a person's living situation and economic status, which can, in turn influence overall health and risk for conditions like stroke.[22] In the same way, the study found that there is no specific occupation associated with POCI. No study specified certain job with stroke but Munyoung Yang et al claimed that, the risk arises from general conditions associated with that job which can cause stress hormone release, and promote atherosclerosis. These risk factors are not specific to a work, but rather to the individual's overall health and lifestyle.[23] Furthermore, the study found that the presence of family history of cervical spondylosis was not associated with POCI. Comparably, a population-based study published in atherosclerosis revealed no evidence linking a family history of cervical spondylosis to an increased risk of posterior circulation stroke.[24] This indicates that genetic predisposition to cervical spondylosis does not appear to increase the likelihood of posterior circulation stroke.

Our study showed obesity as a risk factor for having posterior circulation stroke, many studies showed comparable results.[25-27] The increased amount of adipose tissue in obesity contains inflammatory cells that promote atherosclerosis (hardening of the arteries), particularly in the cerebral arteries. Moreover, obesity can impair nitric oxide dependent dilation in cerebral arteries, a process vital for maintaining blood flow.[28] In addition to that, obesity can lead to inward remodeling of cerebral arteries and increase damage from ischemia, contributing to the risk of posterior circulation strokes.

The main finding of the present study was the presence of cervical spondylosis have a risky association with posterior circulation stoke. Several studies showed comparable results.[29-32] This is due to the degenerative changes and bony growths (osteophytes) in cervical spondylosis can cause vertebral artery stenosis, which is a common extrinsic factor contributing to posterior circulation infarcts. Moreover, the study showed that having cervical spondylosis for more than 5 years was risky for having posterior circulation stroke. This risk is heightened by the degeneration of cervical structures, which can compress the vertebrobasilar system and potentially lead to posterior circulation infarcts, necessitating early intervention. Anyhow, no published study yet did such association. On the other hand, in the present study, the presence of neurological symptoms (like pain, weakness, or numbness) alongside cervical spondylosis for posterior circulation stroke, suggesting a potential spinal cord or nerve compression by the degenerative changes of cervical spondylosis, which goes with Chih-Chi Chen et al study finding.[30] In the

same way, the risk of posterior circulation stroke appeared in this study to be higher with the presence of previous cerebrovascular events, this is due to the fact that patients who have experienced strokes have underlying vascular pathologies or risk factors that can make them more susceptible to further events, including those in the posterior circulation. This is in agreement with meta-analysis conducted by Kim et al.[33] The presence of previous cervical spine injury or previous spine surgery found in this study to have no significant association, in fact this might depend on the specific type and sit of injury and the intervention the patient received. Hirotaka Chikuda et al showed similar finding.[34]

Regarding diabetes mellitus, the study found it was risky for posterior circulation stroke. Similar findings were obtained from akahashi et al.[35] and Morsy et al.[36] As diabetes can cause blood vessels stiffness and it led to the buildup of fatty deposits, which can obstruct the flow of blood vessels. So that managing diabetes is crucial for stroke prevention.

The same thing for hypertension, the study found it was risky for posterior circulation stroke. Many studies showed such findings.[37-39] This is due to the fact that high blood pressure puts strain on the walls of blood vessels, making them weaker and more likely to burst, especially in the delicate posterior circulation system. As a result, patients with hypertension should monitor their blood pressure regularly and take ongoing treatment daily.

Concerning smoking state, the study found that active, passive and even x-smoking history were risky for posterior circulation stroke. Of note, active smoking posing the highest risk, followed by passive smoking, and then x-smoking, which carries a lower, but still elevated risk. Consistent findings were obtained from other studies.[40-41] The risk is due to smoking direct damage to blood vessels, altered blood flow, and increased platelet disfunction, it can induce oxidative stress and promote vascular inflammation, contributing to cardiovascular disease.[42]

The study found patients with posterior circulation stroke, significantly had more positive x-ray cervical spondylosis findings. In same way, the study patients with posterior circulation stroke significantly more MRI positive findings for cervical spondylosis than controls. From the other hand, the study found significant difference between cases and controls regarding their positive CT-angiography findings. Of note, only patients with confirmed diagnosis of cervical spondylosis by MRI were send for CT-angiography. These positive radiological findings can negatively affect vertebrobasilar blood flow, leading to vertebral artery stenosis and increased risk of stroke. Chih-Chi Chen et al[30] Behzadi[43] and Salerno et al[44] showed comparable results.

Regarding comparison between patients with and without cervical spondylosis. The study found, no gender difference, which runs with Zhang et al study findings.[21] But the study found those of more than 50 years were significantly had more cervical spondylosis than less 50 years. As the degenerative changes is part of the normal aging process, which is goes with other studies' findings.[45-46] Rural residence was another significant variable found in this study for cervical spondylosis, Davatchi et al showed consistent finding in Iran[47] while Lv W et al. showed suburban residence had more cervical spondylosis in china.[48] This indicates that factors like age was more significant contributors to the development of the condition. Marital state seems to have no impact cervical spondylosis according to the study findings. However, there is no scientific evident to confirm or deny such findings.

Those who are workers and housewives found in this study to have more cervical spondylosis due to prolonged and repetitive neck-bending postures during related activities, which is in agreement with Shahzadi et al study's results.[49] For the same reason the study found those with less formal education had significantly more cervical spondylosis, similar to Lv W et al. findings.[48] Furthermore, presence of positive family history of cervical spondylosis was another significant variable impacting cervical spondylosis, indicating a possible genetic predisposition to spinal degeneration, comparably to Margetis and Tadi study findings.[50] Moreover, patients with overweight and obesity found in this study to have more cervical spondylosis than normal weight individuals, due to the problem of increased body weight might contribute to additional stress on the spine and potentially accelerating degeneration, Binwu et al showed parallel finding.[51]

Cervical spondylosis patients were significantly had more diabetes than those without diabetes according to the study findings. Due to promoting disc degeneration and increased osteophyte formation, which can lead to nerve root compression, which is similar to Houten et al findings.[52] Hypertension as well found significantly in patients with cervical spondylosis. This is due to the stimulation of sympathetic nerve fiber by degenerative changes of cervical spondylosis that elevates blood pressure.[53] Peng et al. showed comparable findings.[54] Additionally, cervical spondylosis seen more frequently among active and x-smoker according to the study findings. This is explained by nicotine narrowing and inducing inflammation within spinal blood vessels[55], limiting the vital oxygen and nutrients that reach the spinal discs and joints. Rajesh et al illustrated similar results.[56]

5- CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Based on the study findings, cervical spondylosis is a risk factor for getting posterior circulation stroke, however, posterior circulation stroke can be

unpredictable. Anyhow the study explored the following risk factors.

1. Gender: Males' gender was risky for having posterior circulation stroke.
2. Age-related frequency: The likelihood of developing posterior circulation stroke increases with advancing age.
3. Rural living: Rural areas are associated with a higher risk of posterior circulation stroke.
4. Educational attainment: Posterior circulation stroke is more prevalent among individuals who are illiterate or have lower levels of education.
5. Body mass index: Overweight and obesity was associated with high risk of posterior circulation stroke.
6. Systemic disease: Diabetes and hypertension are major risk factor for posterior circulation stroke.
7. Smoking: Smoking is a modifiable risk factor that contributes to posterior circulation stroke event.

5.2 Recommendations

1. Address educational factors

- Educational programs: Create campaigns to raise awareness about posterior circulation stroke prevention and emphasize the need for regular cervical spine exams, especially in lower-education communities.
- Improve access: Enhance medical services in rural through mobile clinics, and subsidized treatments.

2. Promote preventive measures for workers

- Workplace policies: Implement policies for regular spine checking for cervical spondylosis and prevent those with early cervical spondylosis changes from prolong and repetitive movement.

3. Focus on modifiable risk factors

- Smoking cessation: Integrate smoking cessation support into health programs, targeting high-risk populations.
- Systemic disease management: Improve diabetes and hypertension management and education to reduce posterior circulation stroke risk among people with such problems.

4. Implement public health interventions

- Screening programs: Set up routine spinal artery screenings for high-risk groups, such as older adults, diabetics and hypertensive patients.
- Health promotion of the public about lifestyle factors (e.g., smoking, unhealthy work movement) that affect spine and promote preventive behaviors.

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