Addis Ababa University,

College of Health Sciences,

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Department of Neurology

PROVISION OF ORAL HYGIENE CARE TO PREVENT ASPIRATION PNEUMONIA AMONG STROKE PATIENTS AT TIKUR ANBESA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA.

THE IMPACT OF ORAL HYGIENE CARE PROVISION TO PREVENT ASPIRATION PNEUMONIA AMONG STROKE PATIENTS AT TIKUR ANBESA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA.

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BY

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Abstract

Introduction; Stroke is the most common and devastating neurologic disorder. It is responsible for more than six million deaths annually. Medical & neurological complications are important determinants of mortality & poor outcome in stroke patients. Post stroke, complications are common & Aspiration pneumonia is by far the major & most commonly associated with mortality. Aspiration pneumonia results from inhalation of oropharyngeal contents into the lower airways that leads to lung injury and resultant bacterial infection. Major risk factors for AP are those that undermine swallowing function and oral hygiene as well as underlying medical conditions that reduce immune function. Systemic investigation of the possible prevention strategies for aspiration pneumonia; their practice & impact however are very limited.

Objective; to investigate the impact of oral hygiene care provision on the incidence of aspiration pneumonia among stroke patients.

Methods: A hospital-based quasi-experimental parallel group study design was conducted at Addis Ababa, Tikur Anbesa Specialized Hospital employing a consecutive sampling method. The data was collected via a structured online questionnaire. The data then exported from google format to Microsoft excel and cleaned before being uploaded to IBM SPSS version 27 for statistical analysis.

Result; 90 eligible patients who met the inclusion criteria were included in the study, 45 in the intervention arm & 45 in the comparison arm. 5 patients in the intervention & 13 patients in the comparison group have developed aspiration pneumonia. The incidence of aspiration pneumonia was 11.1% amongst participants from the intervention group and 28.9% from the comparison group; study participants who have not received oral hygiene had 5.9 folds increased chance of developing AP as compared to the intervention group, who have received oral care. (AOR=5.9, 95%CI=1.09, 31.89). Logistic regression has also revealed that Low GCS (9-12) & female sex were associated with increased risk of aspiration pneumonia, (AOR=12.3, 95%CI=3.07, 69.48) & (AOR=7.2, 95%CI=1.02, 50.98) respectively.

Conclusion; The study has found that providing oral hygiene care is significantly associated with reduced development of aspiration pneumonia**.** Thus, provision of oral hygiene care effectively reduces the incidence of aspiration pneumonia in stroke patients.

Acknowledgement

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Acronyms

ETB	Ethiopian Birr
IRB	Institutional Review Board
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization
CAP	Community acquired pneumonia
OHAT	Oral health assessment tool
TOR BSST	Toronto bed side swallowing screening test
PI	principal investigator
EDC	early dysphagia screening
AP	Aspiration pneumonia
EDS	Early dysphagia screening
WSO	World stroke organization
PSD	post stroke dysphagia
OHC	oral hygiene care
SAP	Stroke associated pneumonia
LOC	level of consciousness

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1. Introduction

1.1 Background

Stroke refers to a sudden onset of a focal neurologic deficit which is attributable to a focal vascular cause: resulting from a cut off in the blood supply to part of the brain, either the blood vessel being blocked by a clot (in 85% of cases) or ruptured (in 15% of the cases). The brain being the most delicate and vital structure, makes stroke an important cause of disability which is either temporary or permanent. Immediate emergency interventions might be crucial in preventing life-threatening consequences.

Stroke is by far the most common neurologic disorder with devastating outcome. As per the WSO, more than 12.2 million new stroke cases occur each year worldwide. In their life time, One out of four people beyond 25 years of age will have a stroke. And currently people who have experienced stroke approaches over 101 million. Each year, Six & half million people die from stroke and close to 143 million years of healthy life is lost due to stroke related death and disability.[1] These global burden of stroke is also shared in our nation, with over 52,500 new strokes and 38,353 deaths due to stroke reported in the year 2016.[2] The incidence rate of stroke was 30 percent higher than that of HIV infection in that same year. With these numbers expected to grow even higher, it calls in to question the notion that Ethiopia and other resource limited countries are merely affected by infectious diseases.

Stroke causes a detrimental effect on functionality across the several organ systems (viz, speech & language, vision, strength, coordination, balance), and severity and extent of the disability varies greatly[2],[3] Aspiration pneumonia is caused by inhalation of oropharyngeal contents into the lower airways which in turn leads to lung injury and resultant bacterial infection. Patients with depressed sensorium and/or who have an impaired gag or swallowing reflex are potentially predisposed groups & hence aspiration pneumonia tends to be quite common. It is the most frequent & fatal complications among stroke patients. Often diagnosed according to clinical signs & symptoms of pneumonia with a characteristic clinical history (witnessed macro aspiration), predisposing risk factors, and chest radiography findings (such as consolidation in the lower lung fields) (1) (2)

1.2 Statement of the problem

Stroke related complications in general are the most common cause of the high mortality observed in stroke patients. There have been various studies demonstrating the increased mortality of stroke patients pertaining to these complications. Institution based studies in low-income African countries showed stroke mortality ranging from 33.3% - 38.1% many of them revealing these medical complications being an important predictor of mortality. (1) (2) (3) (4) (5) Of these complications Aspiration pneumonia is by far the most prevalent one attributing to around half of post stroke mortality. The Tanzanian study which was the most recent one revealed that the most frequent medical complication among stroke patients was aspiration pneumonia, which constitutes 41.3%. (3) Impaired gag & swallowing reflex as well as oral hygiene are major determinants of AP. These has been demonstrated in numerous studies; of which dysphagia is by far the most frequent & extensively studied. (6) (7) (8)

Local studies as well reciprocate similar findings revealing aspiration pneumonia as a significant predictor of the higher post stroke mortality and the significant associations of dysphagia, low GCS & Severe stroke with aspiration pneumonia risk. A higher mortality of stroke patients were shown from studies in different parts of Ethiopia. A study done in Addis Ababa in three major hospitals with neurology facilities showed a mortality of 23%. Post stroke medical & neurologic complications occurred in 71.8% with aspiration pneumonia ranking first which was detected in 33.8% of patients (9) (10) (11) (12) (13) (14) Another important predictor of AP in stroke patients which is most neglected & understudied is poor oral hygiene. The role of the oral microbial colonization in AP and the limiting role of oral care is now well-recognized. One study which was done in 2021 on Oral Hygiene Status in Patients with Hemorrhagic and Ischemic Stroke revealed the higher prevalence of poor oral hygiene status in stroke patients. (17) Systemic investigation of the possible prevention strategies for aspiration pneumonia; their practice & impact however are very limited. An evidence-based practice project which evaluated the effectiveness of a standard care bundle intervention (which included Oral care among other components) in preventing the occurrence of SAP showed that a significant improvement was observed in preventing SAP in patients in whom a standard care bundle was being implemented. (18) There has only been one study which systematically investigated the outcome of an oral

care regimen combined with free water provision for patients with oropharyngeal dysphagia, with a specific focus on aspiration pneumonia & it showed positive results. (19) This study aimed to investigate the impact of an easy but overlooked prevention strategy, oral hygiene care, on reducing the incidence of aspiration pneumonia in stroke patients.

1.3 Significance of the study

It has been pointed out in most of the previous literatures that mortality associated with aspiration pneumonia or post stroke complications in general, is potentially preventable with a more focused & improved care. Aspiration pneumonia despite being the most common stroke related complication contributing to around half of the post stroke mortality, systemic investigation of the risk factors & prevention strategies is limited. Therefore, studying the efficacy of aspiration pneumonia prevention with oral hygiene care intervention in stroke patients will contribute to filling this gap in literature and provides an evidence-based practice where stroke patient care could be improved. The methodology, being an interventional comparative study will make it an ideally complete & reliable study with high internal validity.

2. Literature Review

Several studies were conducted to assess the predisposing factors for aspiration pneumonia among patients with acute stroke. An important association was consistently found in stroke patients with dysphagia. A hospital based retrospective cross-sectional study done in a tertiary hospital in Barcelona, Spain showed a significant association among stroke patients having PSD & developing AP with aOR=8.04 (95%CI,6.31-10.25) and also with the odds of death with aOR=1.43 (95%CI,1.19-1.73).[5] Another study done in Taiwan compared the occurrence of aspiration pneumonia in 1220 selected patients admitted for acute stroke with dysphagia & non dysphagia groups which were matched according to age; covariates and comediations. The dysphagia group were shown to have 4.69 times increased likely hood of developing aspiration pneumonia. (adjusted hazard ratio [aHR], 4.69; 95% confidence interval [CI] 2.83-7.77; P < .001). The risk of aspiration pneumonia development was highest in the first 3 years of the index visit & among cerebral hemorrhage patients (aHR, 5.04; 95% CI 1.45-17.49; P = .011). The dysphagia group were also shown to have a significantly higher 5-year mortality rate (aHR, 1.84; 95% CI 1.57-2.16; P < .001)[6]

In a meta-analysis done on 2022, showed a higher pooled odds ratio for developing AP 4.08 (95% CI, 2.13–7.79) & mortality 4.07 (95% CI, 2.17–7.63) among stroke patients with PSD and mortality. [7]

In another study that analyzed dysphagia & determinants or predisposing factors for aspiration pneumonia among elderly patients admitted for acute stroke, it was found that recurrent stroke & Number of previous cerebral infarction, severity of stroke quantified by the National Institutes of Health Stroke Scale (NIHSS) score, masticatory muscle paralysis & impaired gag reflex were significantly associated with PSD in these patients. And, aspiration pneumonia development was correlated with NIHSS score (p= 0.017) and dysphagia (p= 0.02). [8] Another observational study done 2015 has also showed a similar finding leading them to draw a conclusion that advanced age and neurologic severity (as determined by the NIHSS score) are the major determinants of pneumonia in dysphagic patients after ischemic stroke.[9] Other risk factors shown to be associated with higher odds of developing aspiration pneumonia were vomiting & low GCS <8.[10] An Australian retrospective study has revealed additional predictors of swallowing difficulties & Aspiration pneumonia; which are; low GCS, ischemic stroke (as compared to hemorrhagic) and significantly impaired mobility. Patients on NGT feeding were also at high risk of respiratory infection. [11]

A prospective study done on stroke patients in 2007 has showed not only the predisposition of patients having PSD for pneumonia, disability, and death, but also the risk reduction through EDS.[12]

Dysphagia Screening as an intervention strategy in preventing pneumonia among acute Stroke Patients was investigated in a Systematic Review and Meta-Analysis done on studies published up to November 2021. It showed that dysphagia screening had significantly reduced the incidence of pneumonia (odds ratio (OR), 0.60; 95% confidence interval (CI), 0.42 to 0.84; p = 0.003; I2, 66%). [13]

Another Systematic Review which included 87,824 stroke patients from twelve studies, majority of which prospective observational studies; provided another evidence that Stroke Associated Pneumonia can successfully be prevented by early dysphagia screening and specialist swallow assessment. [14] Variation in assessment methods still have consistent findings of reduced the risk of SAP.[151617]

Available evidences on the thorough evaluation & diagnosis as well as treatment of poor oral hygiene and its potential role in AP prevention are not as robust. A study which was done in 2021 on Oral Hygiene Status of ICU admitted Patients with Hemorrhagic and Ischemic Stroke, evaluated oral manifestations and their prevalence. The findings were: Seventy-eight patients of periodontitis in 78%, halitosis in 90%, caries in 79% & 83% had positive signs of tongue hypermobility. [18]

Another prospective study which included an aspiration pneumonia group, CAP group & a control group used the OHAT to assess the oral hygiene & evaluated the performance states, serum albumin levels, substance P values in plasma, and oral bacterial counts. The results were reported as; «the oral health as assessed by the OHAT of the aspiration pneumonia group was significantly impaired compared with that of the CAP group and the control (5.13 ± 0.18, 4.40 ± 0.26, 3.90 ± 0.22, respectively; $p < 0.05$). The oral bacterial count in the aspiration pneumonia group (7.20 ± 0.11) was significantly higher than that in the CAP group (6.89 ± 0.12), consistent with the OHAT scores. Oral bacterial count was significantly reduced by oral care» [20]

A retrospective study conducted in Boston assessing the determinants of Pneumonia among patients admitted for acute stroke and Oral Hygiene showed that patients who undertook a systematic OHC had a lower odds of developing hospital-acquired pneumonia. [19]

Effectiveness of AP preventive interventions in a standard care bundle; which consists of SAP risk stratification & screening of patients, EDS & rehabilitation, oral hygiene care, positioning, feeding modification & nursing techniques of traditional Chinese medicine was evaluated by an evidence based practice project which showed a significant improvement in SAP preventions up on implementing the standard care bundle. [21]

Another prospective comparative study done in 2015 in south Africa determined the outcome of an oral care regimen combined with free water provision for patients with oropharyngeal dysphagia, with a specific focus on aspiration pneumonia. It concluded that «it is possible to reduce adverse medical effects of aspiration including fatality by implementing a cost-effective and low resource oral care protocol for patients with dysphagia».[22]

3. Objectives of the study

3.1 General objective

- To investigate the impact of oral hygiene care provision on the incidence of aspiration pneumonia among stroke patients

3.2. Specific objectives

- To compare the incidence of aspiration pneumonia among acute stroke patients in the Intervention group (Oral hygiene care provided) & the comparison group (Oral hygiene care has not been provided)
- To determine the predictors or determinants aspiration pneumonia development

4. Methodology

4.1 Study Setting and Period

The study was conducted in one of the oldest and largest hospitals of the country, named TASH. Established in 1972G.C; is located in the heart of Addis Ababa, the capital city of Ethiopia. In 1998, TASH, the largest referral hospital in the country, with 700 beds, was transferred to the School by the Federal Ministry of Health, and it has since become a university teaching hospital. TASH is now the main teaching hospital for both clinical and preclinical training of most disciplines. As of 2018 the medical record unit has modernized & achieved a great deal launching a digital record system; where in patient profile &/or demographic as well as clinical data can more conveniently stored and retrieved when needed. As per its official website, TASH has over 200 doctors, 379 nurses and 115 other health professionals dedicated to providing health care services. The various departments, faculties and residents under specialty training in the School of Medicine provide patient care in the hospital. It has different clinics which provides service for the patients of the country. The neurology clinic is one of the clinics where there is a high patient load; providing service in all the working days; with an average 70 to 80 patients seen at the clinic daily. The study will be conducted in neurology in patient wards of the hospital.

4.2 Study time

The study was conducted from May 2023 to January 2024 G.C

4.3 Study Design

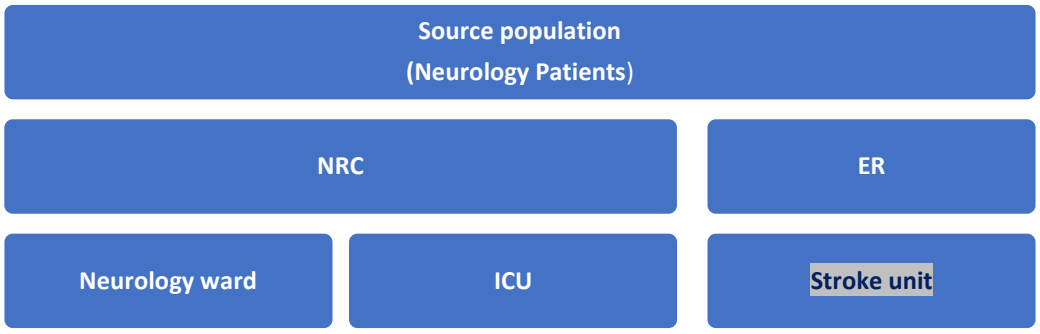
A hospital-based quasi-experimental parallel group study design was employed for this study. A randomized prospective trial would have been preferable to see the impact of oral hygiene provision for acute stroke patients in preventing aspiration pneumonia as parallel comparison between a study group where oral care will be provided & a control group where it will be omitted is needed but this was not plausible due to practical as well as ethical considerations. Primarily, it would have been impractical to blind the intervention, as patients in both arms (the control and interventional groups) were hospitalized in the same room or wards.

Secondarily, continuation of unsystematic and erratic past practices of oral hygiene care in the control group was considered to be unethical. Hence, a quasi-experimental design was chosen where the implementation of oral hygiene care was given uniformly to all patients along with the routine stroke care (as the intervention groups) & the control (comparison) group includes patients who were attended at our hospital prior to the start of these oral hygiene practice as part of the routine stroke care.

4.4 Source and study population

The source population encompass all patients visiting the TASH Neurology unit.

The study population were patients diagnosed with Acute stroke & admitted during the study period



4.5 Eligibility criteria

4.5.1 Inclusion criteria

All Patients aged 18 years & above with a diagnosis with acute stroke

4.5.2 Exclusion criteria

- Those not willing to give an informed consent
- Changed diagnosis of stroke
- Clinical diagnosis of pneumonia present on admission
- Patients with transient ischemic attack (TIA) & NIHSS < 4
- Significant immunodeficiency states
- Patients requiring ICU care, like patients with GCS <8 who needs airway protection

4.6 Sample Size Determination

The least sample size (n) required for the study will be calculated using the formula to estimate

$$n = \frac{2(\bar{P})(1-\bar{P})(Z_{\beta} + Z_{\alpha/2})^2}{(P_1 - P_2)^2}$$

$$\bar{P} = \frac{P_1 + P_2}{2}$$

Where;

n = required sample size

$Z_{\alpha/2}$ **=** critical value for normal distribution at 95% confidence interval= 1.96 ($\alpha = 0.05$).

$Z_{\beta/2}$ = 0.84 at 80% power

P = pooled prevalence = proportion in intervention group(p1) + in control group(p2) / 2

P1 = 50% (0.05), P2 = 33.8% (from previous study)

Sample size = 41

Then 10% of the new sample size is added by considering for non-respondent rate giving a final sample size of 45

Sample size is determined based on the following assumptions; the confidence level to be 95%, margin of error <0.05 to be significant.

4.7 Sampling Techniques

All patients eligible for this study will be enrolled into the study;

Consecutive sampling where every subject meeting the inclusion criteria is selected till the required sample size is achieved. Given the limited number of acute stroke patients attending our unit. this technique is convenient.

4.8 Study variables

4.8.1 Outcome variables

Aspiration pneumonia

4.8.2 Explanatory variables

- Sociodemographic variables: age, sex, educational status, marital status, occupation, household income and residence.
- Life style factors: cigarette smoking, alcohol use, chat chewing, diet, physical activity
- Comorbidities (DM, HTN, Cardiac), Adherence to medications,
- Clinical laboratory & imaging measures
- Type of stroke
- Stroke severity (as assessed by the NIHSS)
- Level of consciousness
- ICH score for hemorrhagic stroke
- Dysphagia (as assessed by Toronto swallowing test)
- Oral hygiene status (as assessed by OHAT)

4.9. Ethical Consideration

Ethical clearance was obtained from the Ethical Committee of the Department of Neurology, School of Medicine, College of Health Science, Addis Ababa University prior to initiation of the study.

4.10. Data collection

Socio-demographic data, personal history, behavioral factors & clinical data were collected by face-to-face interview; a thorough Clinical evaluation. Data on laboratory profiles & imaging studies were obtained. An extraction format that contains study variables of interest was prepared in English language to extract relevant information.

Training was given for selected nurses involved in stroke care & each nurse provided the oral hygiene care consistently. A dental physician couldn't be involved.

For independent patients, each participant received tooth brushing twice a day using nothing other than clean water for safety purposes; after which the participant will rinse out their mouth. This was done manually for dependent participants like low GCS using a suction machine.

Participants or caregivers did complete this routine in addition to the nurse, only for non-dependent patients with good LOC.

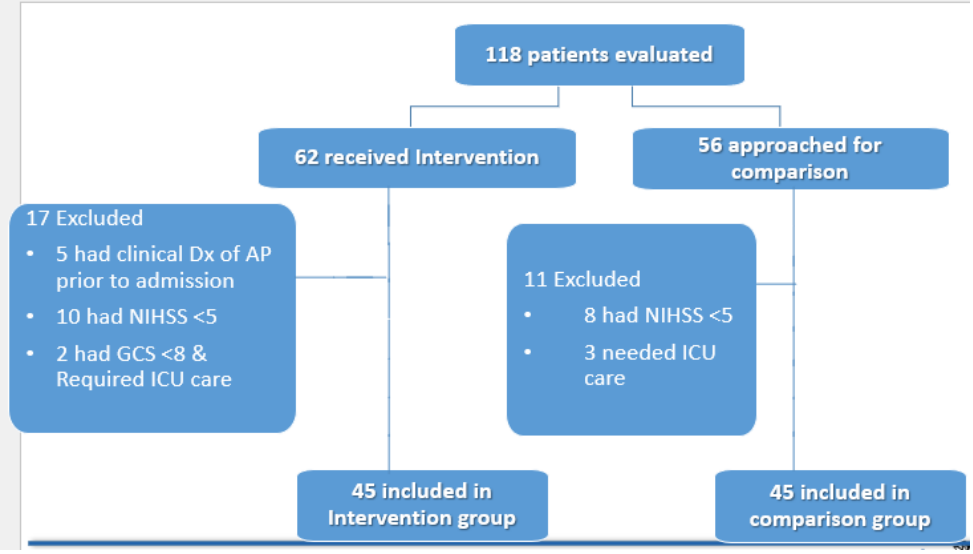
The presence of aspiration pneumonia was monitored throughout the intervention period based on changes in patient symptomatology, patient reports and temperature monitoring.

Data for the study group was collected daily over the course of their hospital stay. The nurse participants did record each implementation of oral care for the participants. Monitoring of these recordings was done daily by the PI, where by adherence and consistency of oral care implementation was ensured.

Validated tools to assess the several variables of interest were used; GCS , NIHSS, ICH , Toronto bedside swallowing screening tool (20), Oral hygiene - Oral health assessment tool (OHAT) (20) (21).

Data from patients admitted for stroke in the months of May 1, 2023 to January 31, 2024 (the intervention group). These were recruited using consecutive sampling. These participants has received the scheduled oral care.

The stroke patients admitted to the hospital from November 1, 2022 to April 30, 2023(control group). Chart review, via consecutive sampling, was used to select a pathology-matched comparison group. These were patients who has not received any sort of oral care.



4.11. Data quality assurance

Pre-testing the questionnaire was done to assess applicability and elucidate the contents before data collection.

Data completeness was ascertained by the PI at each step during data collection & prior to analysis up on entering in to the SPSS.

5. Result

A total of 62 patients who were admitted at the stroke unit in the study period were approached, 45 patients who were eligible were enrolled in the intervention arm & 56 patients were assessed retrospectively through chart review based on the eligibility criteria & 45 included under the control group.

5.1 Sociodemographic characteristics of the study participants

Almost half 43(47.8%) of the study participants were >60 years and 51(56.7%) were male. 78(87%) of the study participants were from urban area and 30(33.3%) had secondary education level and 35.6% were self-employed.

Table 1. The sociodemographic characteristic of the study participants among stroke patients at TASH, Nov 2022, to Jan 2024

Variable	Intervention group (%)	Comparison group (%)
Age in years		
18-45	11(24.4)	12(26.6)
46-60	12(26.6)	11(24.4)
>60	21(46.6)	22(48.8)
Sex of the study participants		
Male	22(48.8)	29(64.4)
Female	23(51.1)	16(35.5)
Residence		
Rural	41(91.1)	37(82.2)
Urban	4(8.8)	8(17.7)
Marital status		
Married	38(84.4)	32(71.1)
Single	5(11.1)	8(17.7)
Widowed	2(4.4)	5(11.1)
Education level		
No formal education	15(33.3)	17(37.7)
Primary	11(24.4)	5(11.1)
Secondary	15(33.3)	15(33.3)
Collage and above	4(8.8)	8(17.7)
Occupation of the last 12 month		
house wife	10(22.2)	16(35.5)
Employee	27(60)	24 (53.3)
Farmer	6(13.3)	2(4.4)
Student	2(4.4)	3(6.6)

5.2 Disease related characteristics of the study participants

In this study 74(82.2%) of the study participants had comorbid disease and from those having comorbid disease; hypertension accounts 57.7% /53.3% followed by arterial fibrillation, DM and heart failure as shown in the table below.

Table 2. Disease related characteristics of the study participants; Nov 2022, to Jan 2024

Variable	Intervention group (%)	Comparison group (%)
Comorbid disease		
Yes	38(84.4)	36(80)
No	7(15.5)	9(20)
The list of comorbid disease (n=74)		
Hypertension	26(57.7)	24(53.3)
DM	5(11.1)	4(8.8)
Heart disease	10(22.2)	13(28.8)
TIA or previous stroke	2(4.4)	3(6.6)
Dyslipidemia	1(2.2)	2(4.4)
HIV	0	1(2.2)
Obesity	1(2.2)	2(4.4)
PAD	1(2.2)	0
Smoker	0	3(6.6)
Systemic malignancy	0	1(2.2)
Alcohol	3(6.6)	2(4.4)

5.3 Stroke related characteristics of the study participants

In this study 69% of the study participants had Ischemic stroke with 42.2% of them having imaging evidence of MCA territory infarction; of which 55.3% had </= 1/3 MCA territory & 45.7% >1/3 MCA territory ischemia extension.

Both the intervention & comparison groups were matched as each group has comparable number of patients with the specific stroke related characteristics.

Table 3. Stroke related characteristics of the study participants; Nov 2022, to Jan 2024

Variables		Intervention group	%	Comparison group	%
Type of Stroke	Ischemic Stroke (I.S.)	31	68.8%	30	67.7%
	Hemorrhagic Stroke (H.S.)	11	24.4%	13	28/9%
GCS	9 – 12	7	15.6%	9	20%
	13-15	38	84.4%	36	80%
NHISS	5 - 15	29	64.4%	30	67.7%
	16 - 20	2	4.4%	8	17.7%
	21 - 42	2	4.4%	3	6.6%
Imaging finding of I.stroke	MCA	21	16.7%	17	37.7%
	PCA	0		0	
	Multiple	0		0	
	Unremarkable head CT	11	24.4%	13	28.8%
Ischemia extension	<=1/3 MCA	11	24.4%	10	22.2%
	>1/3 MCA	10	22.2%	7	15,5%
ICH	0	2	4.4%	6	13.3%
	1	6	13.3%	5	11.1%
	2	5	11.1%	3	6.6%
Imaging findings H.Stroke	Infratentorial	1		0	
	Supratentorial	12	26.6%	15	33.3%
Dysphagia screening	Passed	19	42.2%	24	53.3%
	Failed	11	24.4%	20	44.4%

5.4 Aspiration pneumonia related characteristics of the study participants

In this study 13 of 45 patients (28.8%) from the comparison has developed aspiration pneumonia & form the intervention group 5 of 45 patients (11.1%) have developed aspiration pneumonia. (AOR=5.9, 95%CI=1.09, 31.89, P – value < 0.05).

In this study the incidence of aspiration pneumonia was 11.1% from those of Intervention (oral hygiene) group and 28.9% from those of comparison (non-oral hygiene) group as shown in the figure group.

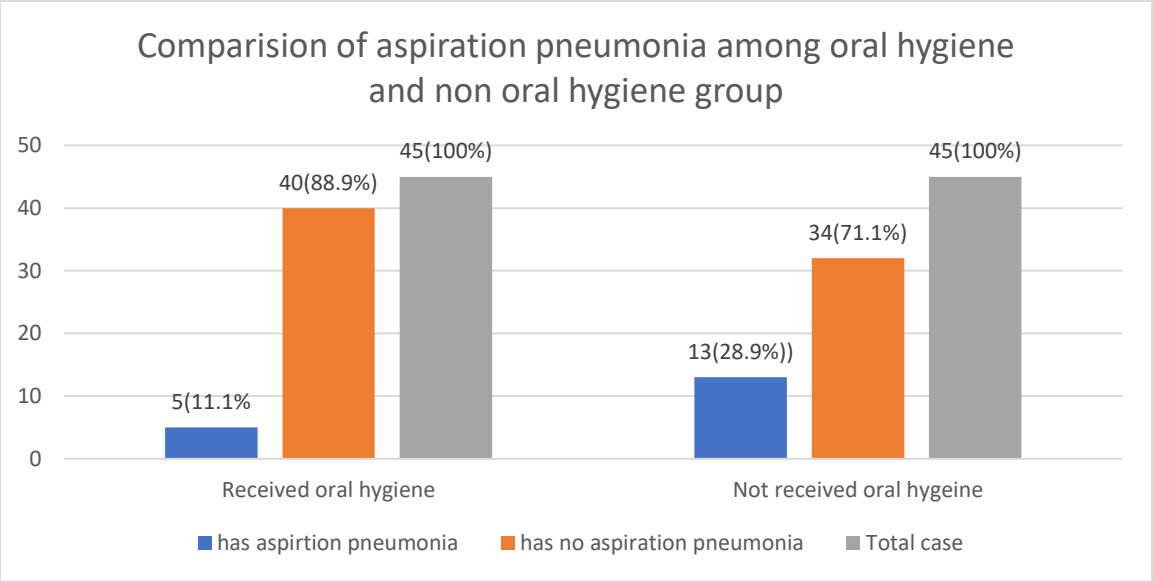


Figure 1. The comparison of incidence of pneumonia among the oral hygiene received and the non-received group

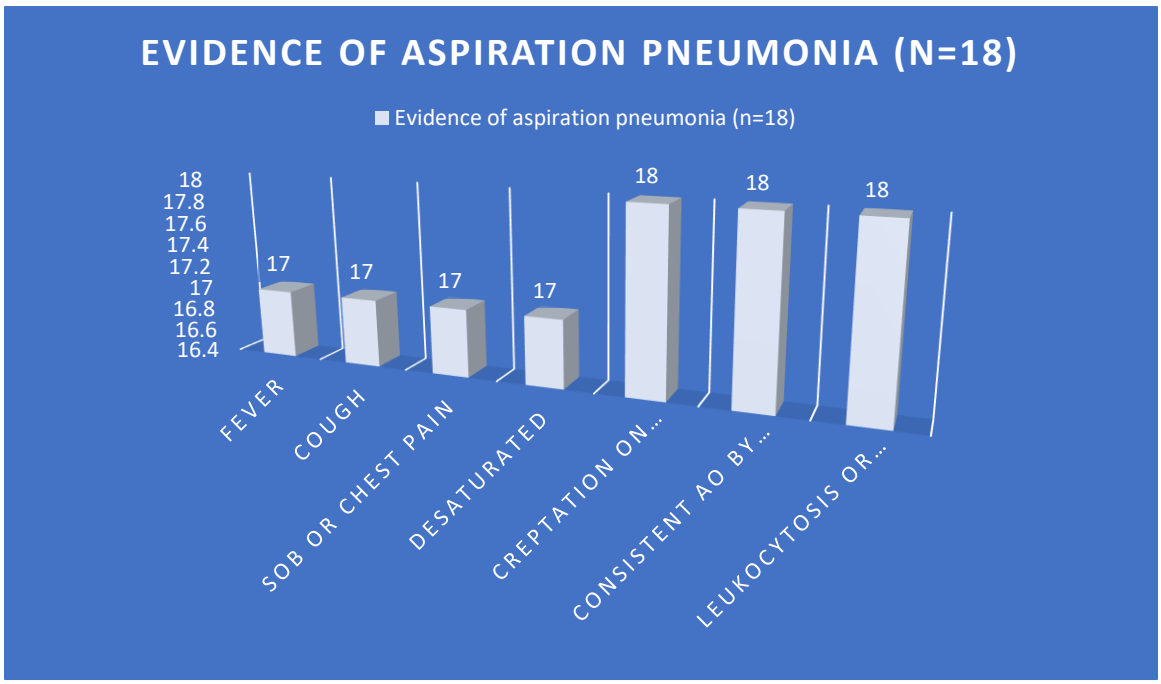


Figure 2. The evidence of aspiration pneumonia.

5.6 The determinant factors of development of aspiration pneumonia among stroke patient

Measuring the strength of association between the dependent & independent variables was made using both bivariate and multivariate logistic regression models. Accordingly, sex and oral hygiene care and GCS were a statistically significant. The multivariate logistic regression revealed that study participants who were female were 12.3 folds increased chance of development of AP compared to male (AOR=12.3, 95%CI=3.07, 69.48) and study participants who have not received oral hygiene had 5.9 folds increased chance of developing AP as compared to the intervention group, who have received oral care. (AOR=5.9, 95%CI=1.09, 31.89). Study participants with GCS of 9-12 had 7.2 folds increased chance of developing AP compared to those with GCS of 13-15 (AOR=7.2, 95%CI=1.02, 50.98).

Table 4. The bivariate and multivariate logistic regression of association between AP and independent variable among stroke patients in TASH, 2023/4.

Variable	Development of AP		P-value	COR with 95%CI	p-value	AOR with 95%CI
	Yes	No				
Sex						
Male	5	46	1		1	
Female	13	26	0.009	4.6(1.17, 14.35)	0.003	**12.3(3.07, 69.48)**
Oral hygiene						
Received	5	40	1		1	
Not received	**13**	**32**	**0.041**	**3.2(1.05, 10.07)**	**0.039**	**5.9(1.09, 31.89)**
Residence						
Rural	5	7	0.054	3.6(0.98, 13.02)	0.082	7.2(0.78, 65.90)
Urban	13	65	1		1	
NIHSS						
<5	3	13	1		1	
5-15	9	50	0.436	0.78(0.18, 3.29)	0.151	0.22(0.03, 1.74)
16-20	3	7	0.511	1.9(0.29, 11.76)	0.310	0.19(0.01, 4.79)
21-42	3	2	0.093	6.5(0.73, 57.83)	0.977	1.1(0.07, 16.15)
GCS						
9-12	**8**	**8**	**0.002**	**6.4(1.96, 20.94)**	**0.049**	**7.2(1.02, 50.98)**
13-15	10	64	1		1	

6. Discussion

Hypertension (57.7%/53.3%), diabetes mellitus (11.1%/8.8%) and cardiac diseases (22.2%/28.8%) were most common medical comorbidities. These findings are in harmony with previous studies done in our set up. A study done here in Addis revealed that hypertension ass the most common comorbidity identified succeeded by cardiac disease, each accounting for 65.6% and 22.7% respectively. Valvular heart disease (VHD) comprising 40% of all heart diseases, and around half having concomitant atrial fibrillation (23) another study conducted in the southern part of the country, at Yirgalem General Hospital showed hypertension (71%) followed with cardiac disease; either ischemic or valvular heart disease(27.4%). (24) A systematic review & meta-analysis has also showed; Proportion of hypertension among stroke patients to be ranged from 31% - 76%; 47% (95%CI: 40–54)] of stroke patients had hypertension; Diabetes mellitus 3% - 23%; 8% (95CI%:6–12); & Atrial fibrillation 1%- 37%, 10% (95%CI: 5–19). (25)

Similar patterns of stroke related clinical characteristics has been identified in keeping with the 2019 Jimma study which depicted that Ischemic stroke being the most prevalent sub-type 60 (51.7%) with hemorrhagic stroke accounting for 48.3%. (26) Similar findings were reported in the north west Ethiopian studies. (27) (28)

As with the findings of prior studies, the incidence of aspiration pneumonia among the comparison group where no oral hygiene care has been provided was much higher accounting for 72.2% of the patients who developed aspiration pneumonia across the sample as compared to the intervention group which was 27.8%. In this study the incidence of aspiration pneumonia was 11.1% amongst participants from the intervention group and 28.9% from the comparison group as shown in the figure which was statistically significant. AOR=5.9, 95%CI=1.09, 31.89, P – value < 0.05). Similar to the Boston study which showed a lower incidence of pneumonia group assigned to OHC compared to controls (14 vs. 10.33%; p = 0.022) with an unadjusted OR of 0.68 (95% CI 0.48-0.95; p = 0.022). (29) Another prospective comparative study done in 2015 in south Africa also showed a similar finding (0 Vs 30%; p = 0,0092). (30) Another study conforming to our findings which showed effectiveness of AP preventive interventions in a standard care bundle; which consists of SAP risk stratification & screening of patients, EDS & rehabilitation, oral hygiene care, among others by revealing a significant improvement in SAP preventions up on implementing the standard care bundle. (31)

Female study participants had 12.3 folds increased development of AP as compared to male (AOR=12.3, 95%CI=3.07, 69.48).

Study participants whose GCS was 9-12 had 7.2 folds increased chance of developing AP compared to those with GCS of 13-15 (AOR=7.2, 95%CI=1.02, 50.98). This finding was supported by the study done in Australian retrospective study (11). This could be due to the fact that Patients with a low GCS have significantly impaired swallowing reflexes, absent/depressed protective reflexes such as coughing and gagging & compromised airway protection mechanisms,

such as the ability to maintain an open airway or adequately clear secretions. This further increases the risk of aspiration and subsequent pneumonia.

Limitations of study

Our study was limited to TASH, Addis Ababa, which is the capital city of Ethiopia hence the results might not be representative of the entire country especially those hospitals with no neurologist or stroke unit.

Other potential determinants of aspiration pneumonia development like the feeding status, EDS (dysphagia screening done prior to any PO ingestion), vomiting & seizure episodes were not assessed.

The stroke related characteristics of the intervention & comparison group were not comparable which might potentially affect the outcome

Strengths of the study:

Our research is one of its kind done in our country regarding the impact of an easy but overlooked prevention strategy on reducing the incidence of aspiration pneumonia, the most common & fatal complications post stroke.

7. Conclusion

The study has found that providing oral hygiene care is significantly associated with reduced development of aspiration pneumonia**.** Thus provision of oral hygiene care effectively reduces the incidence of aspiration pneumonia in stroke patients.

8. Recommendation

Policy makers as well as the professionals involved in stroke care should give a due emphasis to this easy but overlooked interventions and have a change in attitude & practice.

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ANNEX I: *QUESTIONNAIRE (ENGLISH)*

MRN_____Date of interview_____interviewer name_____

Ser. No	Questions	Response and coding	Skip
Section 1: demographic data			
1.1	Age	_____yrs a. less than 15 b. 16-30 c. 31-45 d. 46-60 e. Greater than 60	
1.2	Sex	1. Male 2. Female	
1.3	Place of residence?	1. Urban 2. Rural	
1.4	Marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
1.5	Level of education	1. No formal education 2. Can read and write 3. Primary Education (grade 1-8) 4. Secondary Education (grade 9-12) 5. Higher education	
1.5	Which of the following best describes your **main work** status over the past 12 months?	1. Government employee 2. Self-employed 3. House wife 4. Farmer 5. Others (specify)…….	
1.6	What is your level of education	1. No formal education 2. Primary school 3. Secondary school 4. Higher education	
1.7	Are there Any Comorbid conditions?	A. Yes B. No	
	If yes, what are the comorbid conditions?	A. Hypertension B. Diabetic Mellitus C. Heart failure D. Psychiatric conditions E. HIV	

		F. Space occupying lesion G. TIA or previous stroke H. Dyslipidemia I. Systemic malignancy J. AF K. other specify _____	
1.8	What is the finding on the imaging for ischemic stroke?	A. MCA territory stroke B. PCA territory stroke C. ACA territory stroke D. None (Normal)	
1.9	Ischemia extension on imaging	A. < = 1/3 MCA B. > 1/3 MCA	
2.0	what is the imaging finding for hemorrhagic stroke	A. Infratentorial B. Supratentorial	
2.1	NIHSS score	A. <5 B. 5 – 15 C. 16 - 20 D. 21 – 42	
2.2	GCS	A. 5-8 B. 9-12 C. 13-15	
2.3	ICH score for Hemorrhagic stroke		
2.4	Is Dysphagia screening done?	A. Yes ; B. No	
	If yes, what was the result	A. Passed : B. Failed	
	If failed, what interventions were done		
2.5	Oral hygiene status – OHAT	A. 0 , B. 1 , C - 2	
2.6	Development of Aspiration pneumonia	A. Yes ; B. No	
2.7	If yes, what were the evidences	A. Fever, Cough , SOB or Chest pain B. Low O2 saturation , Creptations on auscultation C. CXR consistent with aspiration pneumonia D. Leukocytosis, elevated acute phase reactant	

ANNEX II: CONSENT FORM

Dear participant, now that you've read about the study and know why it's being done, I'd like to ask for your consent to take part in it.

Participation in this study is entirely voluntary, and you have the freedom to withhold information, refuse to participate, or withdraw from the study at any moment without having to explain yourself to anyone. Withdrawing from the study will have no effect on you.

During the study, all of the information you provide will be kept private.

You have the right to ask questions and receive answers at any time. If you have any queries or issues, please feel free to contact the research team at the following address.

Investigator:

Surafel Tilahun (M.D, neurology resident, AAU)

Address: Phone: +251939142645/+251916305299; email: srfltlhn@gmail.com

ANNEX III: INVESTIGATOR ASSURANCE FORM

I the undersigned resident agree to accept all responsibilities for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research and Publication Committee and /or Department of Neurology, of Addis Ababa University.

I also assert that this proposal is my original work, has not been presented for a degree in any other university, and that all sources of materials used for the proposal have been accordingly acknowledged.

Name of the resident: _____

Signature: _____

Date: _____

ANNEX 4: DECLARATION

I, the undersigned, hereby undertake full responsibility for the project's ethical and scientific conduct. I promise to give my advisor regular updates on my research endeavors and to ask for their guidance and consent as needed. I will promptly notify my advisor and all other parties concerned.

Name of the resident: Dr. Surafel Tilahun (MD, Neurology Resident)

Signature: _____

Date: _____

Approval of the First Advisor:

Name of the advisor: _____

Signature: _____

Date: _____

Approval of the Second Advisor:

Name of the advisor: _____

Signature: _____

Date: _____