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RESEARCH ARTICLE

CLINICO-DEMOGRAPHIC PROFILE AND CLINICAL OUTCOME OF YOUNG ADULT PATIENTS WITH ANEURYSMAL SUBARACHNOID HEMORRHAGE ADMITTED IN QUIRINO MEMORIAL MEDICAL CENTER

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Abstract

In patients younger than 40 years old, aneurysmal subarachnoid hemorrhage (aSAH) is an extremely rare condition. Despite the fact that the clinical features of aSAH have been the subject of extensive research in the general population, there is still some debate regarding the formation of aneurysms and their rupture in the young population. Behaviors such as smoking, excessive alcohol consumption, and the use of sympathomimetic medications are all considered risk factors for aSAH. Being female, the existence of an unruptured cerebral aneurysm, a history of hereditary and family history of aSAH, and certain genetic syndromes all contribute to an increased risk of subarachnoid hemorrhage. An ambidirectional cohort study is utilized in the study on thepatients who are from 19-55 years old admitted at Quirino Memorial Medical Center, Quezon City. The respondents are selected using convenience sampling based on the inclusion and exclusion criteria of the study. The result showed that the Hunt and Hess score still play a significant role in determining the prognosis of young patients with ruptured aSAH. In addition, the survivability of patients in this population does not solely depend on the presence of any behavioral and non-modifiable risk factors for aSAH such as the Modified Fisher Grade Score, location, number, and type of aneurysms on radiographic findings; but the clinical outcome and long-term functional outcome depend on the interplay of the above-mentioned factors, as well as the clinical condition of the patient on admission and the interventions given.

Introduction:-

Aneurysmal subarachnoid hemorrhage (aSAH) has a high case fatality rate worldwide. Mortality rates vary widely across published epidemiological studies, ranging from 8% to 67% [1]. In a more recent systematic review of population-based studies, the incidence of aSAH ranged from 2 to 16 per 100 000 [2]. In the age group of 20–39 years, aneurysmal subarachnoid hemorrhage (SAH) is rare. Understanding the etiology and natural history in this age group is still evolving [3]. Behavioral risk factors for aSAH include hypertension, smoking, alcohol abuse, and the use of sympathomimetic drugs (eg, cocaine). In addition to female sex, the risk of aSAH is increased by the presence of an unruptured cerebral aneurysm (particularly those that are symptomatic, larger in size, and located either on the posterior communicating artery or the vertebrobasilar system), a history of familial and family history of aSAH and certain genetic syndromes [4].

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In the Philippines, no local epidemiologic data has been published on young adults. However, a very alarming increase in the number of hospital admissions of patients with ruptured aneurysm in the young adult population was noted specifically in Quirino Memorial Medical Center (QMMC). Thus, this study will be conducted to determine the incidence, the clinico-demographic profile and the clinical outcome of this specific population admitted at QMMC.

Objectives:-

General Objective

To determine the clinico-demographic profile and clinical outcome of young adults with aneurysmal subarachnoid hemorrhage admitted at Quirino Memorial Medical Center.

Specific Objectives

To determine the demographic profile of patients with ruptured aSAH as to:

1. age
2. sex

To determine the clinical profile of patients with ruptured aSAH as to:

1. Hypertension
2. Smoking status
3. Family History of aSAH
4. Hunt and Hess score (HH Score)

To determine the radiologic findings of patients with ruptured aSAH as to:

1. Modified Fisher Grade score
2. Location and number of aneurysms
3. Type of aneurysm

To determine the survival outcome of patients with ruptured aSAH

To determine the relationship of patient factors with outcomes among aSAH

Significance of The Study:-

The findings of this study may prove beneficial to the following:

Patients. The results of the study may provide valuable information on identifying factors associated with clinical outcome of ruptured aSAH in young adult population. With the available data, protection and prognosis of high-risk patients may be improved.

Clinicians. This study may help physicians in developing guidelines for secondary prevention or risk stratification of patients with aSAH in this particular age group.

Government Institutions. The findings of this study may guide health policy maker in crafting policies directed towards the provision of improved health care services specifically in the prevention and early diagnostics or screening of patients who are at risk.

Researchers. The results of this study may be used as baseline information or support to researches on topics similar or related to what is currently undertaken.

Conceptual Framework

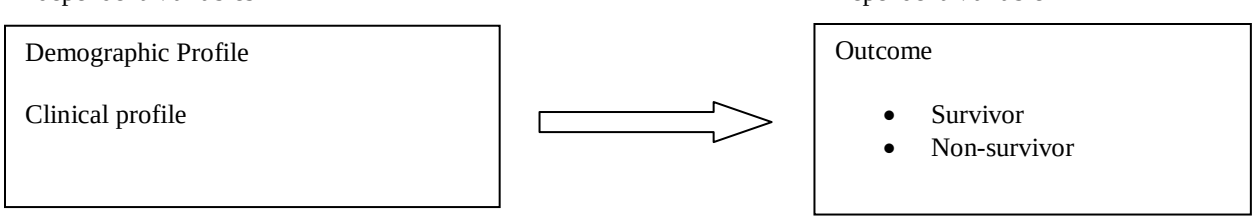

Figure 1. presents the interplay of variables within the study, where the role of independent variables (demographic profile and clinical profile) affect the outcome of the study as per the number of survivors and non-survivors.

Review Of Related Literature:-

Aneurysmal subarachnoid hemorrhage (SAH) is known to be associated with high mortality, morbidity, and burden of healthcare [5].It is responsible for 2% to 7% of all strokes, but it is disproportionately responsible for 27% of the years of life that are lost due to stroke before age 65. [9] The incidence of aSAH ranged from 2 to 16 cases per 100,000 people, according to the findings of a more recent systematic analysis of population-based studies [4]. In Asia excluding Japan, the SAH incidence for 2010 was estimated to be 3.7 per 100000 person-years, and the annual decline since 1984 was 1.3% [6].

Aneurysmal SAH is relatively uncommon in patients younger than 40 years of age with rate of occurrence reported as 10–20%. It is more common in women and in patients 40-60 years old. [7]. The male dominance among patients with SAH has been observed in childhood and adolescence [3].

Studies have been conducted on a wide variety of possible risk factors for SAH; however, only a select few have produced conclusive results [9]. Behaviors such as hypertension, smoking, excessive alcohol consumption, and the use of sympathomimetic substances (such as cocaine) are all considered to be risk factors for aSAH [4]. Non-modifiable risk factors for SAH include a family history of SAH in a first-degree relative, female sex, low educational achievement, low body mass index, and undetermined genetic factors.Some known inherited conditions associated with SAH and/or intracranial aneurysms include adult dominant polycystic kidney disease (ADPKD), Ehlers–Danlos disease (type IV), alpha1-antitrypsin deficiency, sickle cell disease, pseudoxanthoma elasticum, hereditary hemorrhagic telangiectasia, neurofibromatosis type I, tuberous sclerosis, fibromuscular dysplasia, and coarctation of the aorta [9].

Aneurysmal pathophysiology has been theorized to involve congenital weakness in the vessel wall, or degenerative changes resulting in destruction of elasticity of the vessel wall at points of high turbulence such as bifurcations [7]. The pathophysiology that is associated with an aneurysm bursting is still being investigated, in the meantime. The size and location of the unruptured aneurysm, as well as a previous history of SAH, are some clinical variables that may be helpful in determining the risk of rupture of an unruptured aneurysm. Several investigators have evaluated the histology and anatomic features of the aneurysm which may increase the risk of rupture [9].

Eighty-five percent of instances of aneurysmal SAH are caused by saccular (berry) aneurysms. Aneurysms that are fusiform or mycotic occur less frequently. Intracranial aneurysms are usually solitary (70% to 75%) but may be multiple in some patients (25% to 50%). The most common distribution for intracranial aneurysms includes the following arteries: anterior communicating (30%), posterior communicating (25%), middle cerebral (20%), internal carotid bifurcation (7.5%), and top of the basilar artery (7%) [9].

The complaint "the worst headache of my life" is the hallmark of aSAH in an awake patient, and it is mentioned by 80% of patients who can provide a history. In addition, 10% to 43% of patients also say that they have a warning or sentinel headache before developing the aSAH-associated ictus. [4]. Symptoms that increase the likelihood of a subarachnoid bleed as the cause of headache include exertional onset, syncope, vomiting, neck pain, and seizures. Focal neurologic deficits, meningismus, and/or retinal hemorrhage may be present, but up to 50% of SAH patients have a normal neurologic exam [7].

A non-contrast head CT is still the primary diagnostic tool for aSAH [4]. Sensitivity is nearly 100% for the first three days, then gradually declines over the following few days as the subarachnoid blood clears due to spontaneous lysis. [11]. If non-contrast head CT is not definitive, the next recommended diagnostic tool is the LP [7]. Lumbar puncture is often required to show xanthochromia [4]. Magnetic resonance imaging (MRI) is not indicated as an initial diagnostic test for SAH; however, it may be useful if the head CT findings are negative [9]. The challenge with using MRI for SAH is that the blood is combined with CSF that has a high oxygen concentration, thus delaying the transition of blood products to a deoxyhemoglobin state that is better imaged with MRI [7].

The most accurate way to diagnose intracranial aneurysms is still cerebral angiography. A “four-vessel” evaluation of the bilateral internal carotid arteries and vertebral arteries is necessary [9]. CT angiography (CTA) on the other hand, is emerging as an alternative diagnostic test for SAH; however, the diagnostic accuracy may be less than that

of standard angiography [9]. Most experts concur that 2- and 3-dimensional cerebral angiography should be performed after negative CTA in instances of diffuse aSAH pattern [4].

There are several systems of classification for SAH. The Hunt and Hess score and World Federation of Neurological Surgeons grading system are both used to predict patient outcome, and the Fisher grade helps to predict vasospasm [7]. One of the most popular grading systems in SAH, the Hunt and Hess scale, is built on a five-point scale, with grade 5 being the most severe. Hunt and Hess grades 1-3 have a good prognosis and typically call for aggressive therapy, whereas grades 4-5 have a mortality rate of 60–100%, making surgery less advantageous. Another five-grade scale that is frequently used in clinical practice is the World Federation of Neurological Surgeons scale, which has taken the position of the Hunt and Hess scale at many institutions. The prognosis is worsened by other variables, such as advanced age, a pre-existing illness, hyperglycemia, sepsis, fever, delayed cerebral ischemia (DCI), and rebleeding [11].

Initial management of the patient with SAH begins with the stabilization of the airway, breathing, and circulation. Then attention turns to the institution of general supportive and neuroprotective measures, in anticipation of the known complications of SAH [9]. Within 3 hours and almost half within 6 hours of the start of symptoms, rebleeding occurs, and early rebleeding is linked to worse outcomes than later rebleeding [11]. To lower the rate of rebleeding after aSAH, surgical clipping or endovascular coiling of the burst aneurysm should be carried out as soon as is feasible in the majority of patients [4]. Coiling is the preferred method,since it is less invasive than open surgical clipping, but guidelines suggest that coiling should be performed if both are possible [7]. Once the aneurysm is secured, the greatest risk to patient outcome is that of vasospasm and delayed cerebral infarction (DCI) [7].

One of the most frequent causes of death and disability in SAH is DCI, which includes vasospasm of the large arteries. DCI most frequently occurs 7–10 days after aneurysm rupture and resolves on its own after 21 days. Oral Nimodipine 60 mg given every 4 hours after 21 days of SAH demonstrated a significant decrease in both the incidence of cerebral infarction and poor neurological outcomes at 3-months post-SAH in the British Aneurysm Nimodipine Trial, which is the biggest research on this medication [11]. Upon the discovery of DCI, Triple-H treatment may be started. There is currently no agreement on how Triple-H or each of its individual components should be used, but it aims to improve cerebral perfusion in SAH patients with DCI. Triple-H therapy consists of hypervolemia, hemodilution, and hypertension. Although prophylactic triple-H therapy for preventing DCI was acceptable, current evidence does not support its efficacy and recommends maintaining normovolemia [5].

Follow-up imaging after endovascular aneurysm therapy is needed to determine the degree of aneurysm obliteration in the treated aneurysm and assess for change in number and size of untreated aneurysms [10].

Research Methodology:-

Study Design

The study utilized the ambidirectional cohort study, since this research design is particularly significant for analyzing exposures that may have both short and long-term outcomes, or even with more than one outcome. The analysis of medical emergencies such as outbreaks, epidemics, or any other events that imply an unforeseen exposure and for which data must be collected retrospectively can benefit from this kind of study [27].

Study Population

Inclusion Criteria

All Service and Pay patients aged 19-55 years old admitted from January 1, 2019 – December 31, 2020with radiologically diagnosed ruptured aneurysmal subarachnoid hemorrhage using non-contrast Ct scan (NCCT), CT angiogram (CTA), Magnetic Resonance Imaging (MRI), Magnetic Resonance Angiography (MRA), or Digital Subtraction Angiography (DSA) irrespective of clinical presentation were included in the study.

Exclusion Criteria

1. Patients with aSAH aged less than 19 years old and more than 55 years old
2. Patients who were discharged against medical advice (DAMA) or transferred to other institution during the study

The patients were selected as per protocol based on the inclusion and exclusion criteria.

Setting/Location
The study was conducted at Quirino Memorial Medical Center, Quezon City, a tertiary hospital under the Philippine Department of Health.

Sample Size
Convenience sampling was used in the study. The patients were selected as per protocol based on the inclusion and exclusion criteria.

Study Variables
In this study, the clinical outcome of patients with ruptured aSAH was classified into two:
1. Survivor – This is defined as a patient who has ruptured aSAH and was discharged alive. The Modified Rankin Scale will be utilized for scoring.(see Table 4 under Appendices.)
2. Non-survivor – These are patients who have ruptured aSAH and died as a direct cause of the disease.

Definition Of Terms
Stroke in the young - In the scientific literature on young adult stroke, the upper age cut-offs have varied from 30 to 65 years, being most commonly 50 or 55 in the recent literature. Although most of the scientific data come from studies using a lower age cut-off [22]. In this study, "young adults" refer to aSAH occurring in adult people aged less than 55 years.

Cerebral Aneurysm –This is a bulging, weakened area in the wall of an artery in the brain, resulting in an abnormal widening, ballooning, or bleb [12].

aSAH – This refers to the extravasation of blood into the subarachnoid space caused by a ruptured aneurysm [13].

Hunt and Hess score – A scoring system used as a predictor of prognosis/outcome with a higher-grade correlating to a lower survival rate [14], (Table 3 underAppendices)

Modified Fisher Grade score –A scoring system which classifies appearance of subarachnoid hemorrhage on head CT scan [15].It is used in predicting cerebral vasospasm [25].

Data Collection Procedures
This is an ambidirectional analysis of charts of patients selected from hospital records based on inclusion and exclusion criteria, admitted from January 1, 2019 to December 31, 2020. Data of the selected patients were collected from the medical records by the researcher. A data collection form was utilized and each patient have an identity code. General data, complete history, clinical and radiographic findings and interventions noted in the medical record were analyzed. Primary outcome was assessed as survivor and non-survivor.

All data gathered were tabulated and reviewed by the researcher and a statistician. The data sheets were kept confidential by the researcher until all data have been interpreted, after which they will be shredded after a year. No other person has access to the documents, laboratories and other files of the study other than the researchers, statistician and reviewers involved.

Target Time Period
The study was conducted from January 1, 2019 – December 31, 2020.

Data Processing And Analysis
The data obtained was organized and each patient was given an individual code. Raw data were stored to prevent loss. The data was encoded and analyzed using the Statistical Package for Social Sciences (SPSS) software. Interpretation of the analyzed data followed based on the tables prepared.

Descriptive statistics includes frequency and percentage to present clinical and demographic variables of the respondents. Frequencies, percentages and means were used particularly in the tabular presentation of clinical and demographic profile of the patients.

For inferential analysis, a Fisher's exact probability test was used to test for the analysis of two categorical variables (either nominal or ordinal) for small sample sizes. The null hypothesis ofthe test will be rejected if the computed exact p-value is less than the level of significance.The level of significance was set at 95% confidence interval [23].

Ethical Considerations

The identity of the patients included in this study were kept confidential and only coded numbers instead of names were used to assure anonymity of the source. All data were encoded in a secure laptop with password and only the researcher and statistician have access to them. The data gathered was saved during the entire duration of data processing, writing of final paper until the final presentation of research. Once the final research output has been presented and approved by the research committee, all records and raw data will be destroyed after a year. The data contained in the laptop will be deleted and all notes pertaining to the study will likewise be discarded by shredding.

Significant data and results of this study may be presented to the medical community, and may be used as baseline for future researches, and may be also cited as reference for other related studies. The anonymity of participants will be kept with utmost confidentiality when research is shared during presentation in scientific forum or when submitted for publication. In all instances, strict confidentiality will be maintained, and no information that will identify the patient as participant will be disclosed.

An informed consent is no longer required from the participants as the data gathered are all part of the routine interview and examination of the patients on initial consult and succeeding follow-up.

Results and Discussion:-

With a reported incidence rate of 10–20%, aneurysmal SAH is rather rare in patients under the age of 40 [3]. In this study, a total of 39 patients with records of Aneurysmal Subarachnoid Hemorrhage (aSAH) were obtained from January 2019 to December 2020 but only 31 patients have entries on the outcome variable of survival. Patients without the outcome variable were removed from the analysis. Moreover, 17 out of 31 patients, or about 54.8% of the patients have been safely discharged from the hospital while the remaining 14 patients died due to aSAH. The summary of the clinicodemographic characteristics of the collected patients is presented in the following tables.

Table 1:-Demographic Profile of Young Adults with Aneurysmal Subarachnoid Hemorrhage.

Demographic Profile	Outcome				Total		p-value [b]
	Discharged		Expired				
	Count	%[a]	Count	%[a]	Count	%	
Age group							0.073
19 to 35 years old	6	85.7%	1	14.3%	7	22.6%	
36 to 55 years old	11	45.8%	13	54.2%	24	77.4%	
Sex							0.061
Female	4	33.3%	8	66.7%	12	38.7%	
Male	13	68.4%	6	31.6%	19	61.3%	

[a] Presents row percentages

[b] p-values obtained from the Fisher's exact test

Based on the table, about 7 patients were19 to 35 years old and the remaining 24 patients are between 36 to 55 years of age. Out of the 7 in the age bracket of 19 to 35 years old, 6 of them (85.7%) were safely discharged from the hospital. On the other hand, only around 45.8% of the 36-55 years old age group were discharged from the hospital. This is about half of the survival rate of the younger age bracket group. This may indicate that age is associated with deaths due to aSAH. In particular, older patients have a higher risk of death from aSAH than younger patients. However, based on the results of the Fisher's exact test, a p-value of 0.073is insufficient to conclude that age is associated with the mortality of patients with aSAH.

There are more men than women among SAH patientsboth in adolescence and in childhood. However, the reports on the sex dominance in young adults are variable [3]. In the present study, male dominance was also noted. Of the total of 31 patients, 19 (61%) were males and 12 (39%) were females, resulting in a male to female ratio of 1.6:1. About two-thirds of the male patients were safely discharged from the hospital. On the other hand, two-thirds of the female patients have died due to aSAH. This could be an indication that sex is related to aSAH-related mortalities.

However, with a p-value of 0.061 on Fisher's exact test there is insufficient evidence to claim that sex is associated with the deaths of patients with aSAH. This is in contrast to the study done by S. Chotai et. al (2013). wherein they observed that in the exact regression model, male sex predicted poor outcomes; however, they also added that this difference reflects that intracranial aneurysm formation and growth may be linked to various factors in young adults [3].

Table 2:- Clinical Profile of Young Adults with Aneurysmal Subarachnoid Hemorrhage.

Clinical Profile	**Outcome**				**Total**		**p-value [b]**
	Discharged		**Expired**				
	Count	**%[a]**	**Count**	**%[a]**	**Count**	**%**	
Chief Complaint							0.0503
Loss of consciousness	1	16.7%	5	83.3%	6	19.4%	
Others	16	64.0%	9	36.0%	25	80.7%	
Smoking							0.725
Current smoker	9	64.3%	5	35.7%	14	45.2%	
Non-smoker	7	46.7%	8	53.3%	15	48.4%	
Quit smoker	1	50.0%	1	50.0%	2	6.5%	
Comorbidity							0.727
Diabetes mellitus	1	50.0%	1	50.0%	2	6.5%	
Hypertension	6	46.2%	7	53.8%	13	41.9%	
None	10	62.5%	6	37.5%	16	51.6%	
Family history of aSAH							NA
No history	17	54.8%	14	45.2%	31	100.0%	
Hunt and Hess Score							0.019*
1	8	66.7%	4	33.3%	12	38.7%	
2	5	83.3%	1	16.7%	6	19.4%	
3	4	66.7%	2	33.3%	6	19.4%	
4	0	0.0%	4	100.0%	4	12.9%	
5	0	0.0%	3	100.0%	3	9.7%	
Modified Fisher Grade Score							0.113
0	6	100.0%	0	0.0%	6	27.3%	
1	2	50.0%	2	50.0%	4	18.2%	
2	2	40.0%	3	60.0%	5	22.7%	
3	3	42.9%	4	57.1%	7	31.8%	
4	6	100.0%	0	0.0%	6	27.3%	
Location of aneurysm							0.704
ACA	2	100.0%	0	0.0%	2	7.4%	
ICA	2	66.7.0%	1	33.3%	3	11.1%	
MCA	3	50.0%	3	50.0%	6	22.2%	
PCA	1	100.0%	0	0.0%	1	3.7%	
Acomm	5	41.7%	7	58.3%	12	44.4%	
Pcomm	0	0.0%	1	100.0%	1	3.7%	
BA	1	100.0%	0	0.0%	1	3.7%	
VA	1	100.0%	0	0.0%	1	3.7%	
Type of aneurysm							1.0
Berry	1	100.0%	0	0.0%	1	5.9%	
Fusiform	1	100.0%	0	0.0%	1	5.9%	
Saccular	9	60.0%	6	40.0%	15	88.2%	
Number of aneurysms							0.569
Single	11	68.8%	5	31.3%	16	88.9%	
Multiple	1	50.0%	1	50.0%	2	11.1%	

[a] Presents row percentages

[b] p-values obtained from the Fisher's exact test

*Denotes significance at a 5% significance level

Table 2 presents the clinical profiles of the patients with aSAH. According to the majority of the literature, 80% of SAH patients experience "the worst headache of my life," making it one of the most recognizable clinical presentations in medicine.[11].Meanwhile, 50% of patients experience syncope, a condition that could be caused by a sudden increase in intracranial pressure (ICP), which is greater than the mean artery pressure (MAP), leading to critically low cerebral perfusion pressure (CPP) and widespread cerebral ischemia [9].Based on the table, about 19.4% of the patients have experienced a loss of consciousness or syncope. Other chief complaints from the patients include headache (61.3%), a decrease in sensorium (9.7%), focal weakness and nape pain. Out of the 6 patients who experienced a loss of consciousness, 5 of them died eventually. This may show that this initial presentation is associated with the mortality of the patients. But based on the results of the Fisher's exact test, the relationship is deemed insignificant at a 5% significance level (p-value = 0.0503).

Young adults' aneurysm formation and rupture mechanisms are still poorly understood. One of the most crucial elements in the development and expansion of aneurysms continues to be hemodynamic stress compounded by hypertension. Atherosclerosis is the main cause of the internal elastic lamina's degeneration, which appears to be necessary for aneurysm formation. [3]. An aneurysmal cause of SAH has similar risk factors associated with aneurysm formation. The risk factors that are most frequently seen are hypertension, smoking, and family history. Alcohol, sympathomimetic drugs, and a lack of estrogen are other risk factors [24]. In the present study, we analyze these modifiable risk factors which might have a correlation in the outcome of these group of patients with aSAH.

Based on the table, around 45% of the patients are smokers while 48.4% of them are non-smokers. Moreover, about 53.3% of the non-smokers have died due to aSAH but only 35.7% of the current smokers have died due to aSAH. This may suggest that smoking is not associated with deaths due to aSAH. This is confirmed by the results of the Fisher's exact test (p-value = 0.725). Therefore, at a 5% significance level, there is no sufficient evidence to say that smoking increases the risk of death due to aSAH. This is also true with the study done by S. Chotai et. al. wherein they stated that in this cohort of young individuals, smoking history was not found to be a predictor of bad outcomes [3].

Furthermore, about 42% of the patients have hypertension and two patients have diabetes mellitus. It is clear from the table that the death rate of patients without comorbidities is lower than those with comorbidities. However, the result of the Fisher's sign test (p-value = 0.727) concludes that there is no significant relationship between the presence of comorbidities and mortality due to aSAH. The result of this study is again supported by the study done by S. Chotai et. al. wherein they found out that the history of hypertension was not significantly associated with the outcome at discharge of young adults with aneurysmal subarachnoid hemorrhage. However, they added that the history of hypertension was a significant predictor of the outcomes at mean 2-year follow up [3].

On a short note, none of the patients have a family history of aSAH. Thus, this study cannot conclude whether family history is associated with deaths due to aSAH or not.

In this study, anterior communicating artery aneurysms were found in 12 out of 31 patients followed by middle cerebral artery aneurysms in 6 out of 31 patients. This is the same as with the general population wherein the anterior communicating artery (30%) is the most common location of intracranial aneurysm [9]. This is in contrast with the study done by S. Choitai et. al. (2013), wherein they found out that the ACA (47.2%) was the most common site in young adults [3].

Eighty-five percent (85%) of aneurysmal SAH cases are caused by saccular (berry) aneurysms, the majority of which originate from the circle of Willis and occur in the anterior circulation. Additionally, cerebral aneurysms are typically solitary (70% to 75%) but may be multiple (25% to 50%) in some cases. [9]. In this study, 15 of the classified aneurysms were saccular, 16 have solitary aneurysm and only 2 patients have multiple aneurysms. This is similar to that seen in the general population as mentioned above.

Based on the results of the Fisher's exact test, location, type, and the number of aneurysms is not associated with the mortality of the patients with aSAH. This result is again similar with the study done by S. Chotai et. al. (2013), specifically in terms of the location of the aneurysm wherein they concluded that the location of aneurysm was not found to be a significant predictor of outcomes for these group of patients with aSAH [3].

Meanwhile, most of the patients have a Hunt and Hess (HH) score of 1 (38.7%) upon presentation. Moreover, all of those patients with HH scores of 4 and above have died due to aSAH. The survival rate decreased from 66.6% for patients with HH scores of 1 to 0% for patients with HH scores of 4 and 5. Using Fisher's exact test confirms the relationship between HH score and the mortality of patients with a p-value of 0.019. Particularly, patients with higher HH scores have a lower chance of surviving than those with lower HH scores. This is why until now, the Hunt and Hess scoring system which is used to classify the severity of a subarachnoid hemorrhage based on the patient's clinical condition is also used as a predictor of prognosis/outcome with a higher-grade correlating to a lower survival rate [14].

In addition, most of the patients have an MFG score of 4 (31.8%) followed by patients with an MFG score of 1 (27.3%). All the patients with MFGS of 1 survived while more than half of the patients with MFGS of 4 did not survive. This might be an indication that higher MFGS leads to lower survival rates, but the result of Fisher's exact test says otherwise. With a p-value of 0.113, there is insufficient evidence to claim that MFGS is associated with the mortality of patients with aSAH. This is in contrast with the results of the study done by Martin et. al (2021).They concluded that both grading systems are highly correlated with clinical outcome. Increasing Fisher grade was highly correlated with poor outcome and with mortality. However, they also added that the modified Fisher grading system has a higher index of inter-rater agreement [26].

Conclusions, and Recommendations:-

Mortality in young people with aneurysmal subarachnoid hemorrhage is clinically independent of age and sex.As with the general population, the Hunt and Hess score still play a significant role in determining the prognosis of young patients with ruptured aSAH.This is due to the fact that it identifies the severity of the subarachnoid hemorrhage at the onset, patient's outcome can be easily recognized. In addition, the survivability of patients in this population does not rely solely on the presence of any behavioral and non-modifiable risk factors for aneurysmal subarachnoid hemorrhage, the Modified Fisher Grade Score, location, number, and type of aneurysms on radiographic findings but the clinical outcome and long-term functional outcome depends on the interplay of the above-mentioned factors, the clinical condition of the patient on admission and the interventions given. However, since this study has a small sample size, the researcher recommends carrying out the study to a larger population with different age groups and an equal population of male and female. It is further recommended to explore additional etiologies and risk factors for poor outcomes in individuals with aSAH that were not included in this study, such as the size of the aneurysm and a history of dyslipidemia. And lastly, the researcher also recommends to investigate the treatment and interventions given to the patients involved to be able to identify the association between the severity of their condition and their prognosis state.

In addition, the current study may also be elevated to a larger area of conduct by having patients from other hospitals within the target location as part of the population. This is expected to yield a more diverse result for the study itself.

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Appendices

Table 3:- Hunt and Hess Grading and Predictive Mortality from subarachnoid Hemorrhage (14).

Grade	Characteristics	Mortality Rate (%)
0	Unruptured aneurysm without symptoms	0
1	Asymptomatic or minimal headache and slight nuchal rigidity	1
1a	No acute meningeal or brain reaction but with fixed neurological deficit	1
2	Moderate to severe headache, nuchal rigidity, no neurologic deficit other than cranial nerve palsy	5
3	Drowsy, confused, or mild focal deficit	19
4	Stupor, moderate to severe hemiparesis, possibly early decerebrate rigidity, and vegetative disturbances	42
5	Deep coma, decerebrate rigidity, moribund	77

Table 4:- Modified Fischer Grade Score and Risk for Delayed Cerebral Ischemia [15].

Modified Fischer Grade Score	CT scan Findings	Risk for DCI (%)
0	No SAH or IVH	0
1	Minimal/thin SAH, no IVH	6
2	Minimal/thin SAH, with IVH in both lateral ventricles	15
3	Dense SAH, no IVH	34
4	Dense SAH, with IVH on both ventricles	35