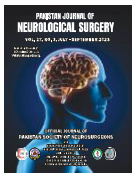

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Original Article

Factors Predicting Outcome of Surgically Treated Acute Subdural Hematoma

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ABSTRACT

Objective: The study aimed to evaluate operative mortality and prognosis factors in posttraumatic acute subdural hematoma patients.

Material & Methods: A prospective cross-sectional study was done in the Department of Neurosurgery, Ayub Teaching Hospital Abbottabad. 82 patients operated for Acute Subdural Hematoma were included in the study. Variables that influence the outcome were recorded. The outcome was measured in terms of mortality.

Results: Of 82 patients operated on, 61 were male, and 21 were female. 51 were <40 old years, 21 were aged 41-60, and 7 were over 60. The most common cause is fall from height (47.6%). Cerebral contusion is often associated (28%). Overall mortality: 39.2%. Male mortality: 29.2%, female: 9.7%. Surgery >4 hours post-injury had higher mortality (18.2%) vs. <4 hours (8.5%). 14/43 GCS <8 patients survived, with no deaths when GCS >12. Pupillary abnormalities had higher mortality (31.9%) vs. normal pupils (7.3%). No deaths with hematoma thickness <10mm and only 1 survived with a thickness >16mm. 25/29 died with midline shift >11mm.

Conclusion: Prognostic factors for surgically treated traumatic acute subdural hematoma include GCS at presentation, pupils, hematoma thickness, midline shift, and time to surgery. Better outcomes associated with GCS>9, normal pupils, hematoma width <1.5cm, midline shift <1cm, and surgery within 4 hours.

Keywords: Acute subdural hematoma, operative mortality, prognostic factors.

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INTRODUCTION

Acute subdural hematoma is a collection of blood below the Dura matter but external to the brain and arachnoid layer. Its prevalence is 50 – 60% of all subdural hematomas, and is the most common type of post-traumatic intracranial hematoma accounting for 24% of cases of severe traumatic brain injuries.[1,2] It comprises 10-20% of cases in patients admitted with head injury and about 60% of patients presenting with severe traumatic brain

injury with a Glasgow coma scale of 8 or less.[3] The majority of the cases are associated with a traumatic episode; However, it may happen naturally or after minor trauma in patients getting blood thinners {aspirin clopidogrel} therapy or after aneurysmal rupture.[4] Road traffic accidents are responsible for most of the cases of acute subdural hematoma in the young population while a trivial fall affects the elderly.[5] Although no operative surgical procedure has been well established yet, Decompressive craniectomy is amongst the most ideal surgical procedure for the treatment of patients with severe traumatic head injury to avert intracranial hypertension caused by brain edema.[6] Despite development and improvement in Neuro intensive care and treatment, acute subdural hematoma is still a condition with very high mortality and exceedingly bad prognosis among traumatic brain injuries with a reported mortality rate varying from 36 to 79%.[7] Mortality from acute subdural hematoma is affected by many variables including age, GCS at presentation, pupillary response, hematoma volume, midline shift, time since injury to surgical intervention, additional traumatic pathology, and the presence of pre-existing comorbidities. Earlier studies have established that the death rate was greater in patients with low GCS, greater hematoma volume, and excessive midline shift and in those who were young.[8,9,10] Yilmaz et al, reported a high death rate among old age patients and in those with a GCS score of less than 6 on arrival.[11] Furthermore, some studies reported a higher mortality rate in patients with associated other traumatic lesions, mainly in those having experienced fall out of RTA.[12,13] Acute subdural hematoma with compressed brain and tentorial herniation should be immediately operated on via craniotomy with or without Decompressive craniectomy to minimize secondary brain damage.[14] The effect of a time interval that lapses amid injury and surgery is of particular interest, as this is one of the important factors that affect the outcome. Walcott et al, stated that, in patients undertaking craniectomy for subdural hematoma, the time interval from injury to surgery is inversely related to mortality.[15] Although the age, GCS at presentation, neuroimaging findings, and neurologic examination at the time of presentation are highly linked with the outcome, the role of these factors has not yet been well established.[11] We aim to know the operative mortality and factors that affect the outcome of patients operated for traumatic acute subdural hematoma.

MATERIAL AND METHODS

Study Design and Study Setting

This prospective cross-sectional study was done in the Department of Neurosurgery, Ayub Teaching Institution Abbottabad from 1st July 2021 to 30th June 2022. Approval was taken from the Hospital's ethical committee.

Inclusion Criteria

82 patients who were operated on for traumatic Acute Subdural Hematoma were included in the study.

Exclusion Criteria

Patients treated conservatively or expired before surgical interventions were excluded from the study. Cases of non-traumatic acute subdural hematoma were also excluded from the study.

Data Collection

Variables including age, gender, presence of comorbidities, mechanism of trauma, GCS at the time of admission, pupillary abnormalities, associated intra or extra-cranial pathologies resulting from the same event, the time interval between injury and surgical intervention, thickness of hematoma and midline shift measured on axial CT slice were recorded.

Postoperatively all patients were managed in Neurosurgical ICU and were shifted to the ward once clinical improvement was observed. Those who survived till discharge from the hospital were followed until the first follow-up visit to the outpatient Department. Outcome was measured in terms of mortality (expired or alive).

Data Analysis

Data was analyzed using SSP IBM-24. The chi-square test was used to determine the effect of various recorded variables on mortality. P value below 0.05 was considered statistically significant.

RESULTS

Gender Incidence

Of 82 patients who underwent surgical intervention for acute subdural hematoma, 61 were male and 21 were female.

Age Distribution

40 out of 51 patients were below 40 years, while 21 were in the age range 41-60 and the remaining 7 were above 60 years.

Distribution by Mechanism of Trauma

History of height was the most frequent cause of ASDH (47.6%) followed by motor vehicle accidents (43.9%) and physical assault (8.5%) with no clinically significant difference in mortality.

Associated Lesions

Associated lesions resulting from the same event either intra or extra cranially were found in 52.4% of cases with cerebral contusion being the most common at 28% (23) followed by extradural hematoma at 9.8% (8), subarachnoid hemorrhage at 6.1% (5), depressed skull fracture 3.7% (3) and pneumocephalus 2.4% (2).

Operative Mortality

Overall (operative) mortality was 39.2%.

Effect of Clinical Variables on Outcome (Mortality)

Mortality in males was 29.2% and in females was 9.7%. However, this discrepancy was not statistically significant. Mortality below 40 years of age was 22%, between 41-60 years of age was 11%, and above 60 years of age was 6.1%. The discrepancy in mortality among different age groups was not statistically significant (P=0.182) **(Table 1).** An increase in mortality was observed when surgery was deferred to greater than 4 hours after the event of head injury. Patients who operated after 4 hours had significantly higher mortality (18.2%) compared to those who operated within 4 hours of head injury (8.5%) (P=0.02) **(Table 2)**. GCS on admission, presence of pupillary abnormalities, hematoma thickness, and midline shift on CT scan considerably affect the outcome. Only 14 out of 43 patients with GCS less than 8 survived, while for patients with GCS 9-12, only 3 out of 30 were expired. No patient died when the GCS at the time of presentation was greater than 12. Patients with increased pupillary diameter and or impaired response to light have significantly higher mortality (31.9%) compared to those with normal pupillary diameter and response (7.3%) **(Table 2).** None of the patients expired when the hematoma thickness was less than 10mm. 21 out of 68 patients expired when hematoma thickness was 11 to 15mm. only 1 patient survived when hematoma thickness was greater than 16mm. 7 out of 53 patients with midline shifts of less than 10mm died. 25 out of 29 patients died when the midline shift exceeded greater than 11mm **(Table 3).**

DISCUSSION

In patients with a severe traumatic head injury,

about 33% present with acute subdural hematoma.[16,17] It is well thought-out to be the most dangerous traumatic brain injury with high mortality ranges from 40-90%.[18,19,20] The magnitude of impact is usually much higher which makes it much more lethal than an epidural hematoma. Moreover, associated underlying brain injury is often present which may be less common with epidural hematoma. ASDH with a width greater than 1 cm or midline shift greater than 0.5 cm

Table 1: Effect of age, gender & mechanism of trauma on outcome (mortality) of patients operated for ASDH.

Age in Years		Outcome (Mortality) Alive	Expired	Total	P values
1.	<40	33(40.2%)	18(22%)	51(62.2%)	0.182
2.	41-60	15(18.3%)	9(11%)	24(29.3)	
3.	>60	2(2.4%)	5(6.1%)	7(8.5%)	
Total		50(61%)	32(39%)	82(100%)	
Gender		**Alive**	**Expired**	**Total**	
1.	Male	37(45.1%)	24(29.2%)	61(74.3%)	0.989
2.	Female	13(15.8%)	8(9.7%)	21(25.6%)	
Mechanism of Trauma		**Alive**	**Expired**	**Total**	
1.	RTA	20(24.4%)	16(19.5%)	36(43.9%)	0.629
2.	Fall	25(30.5%)	14(17.1%)	39(47.6%)	
3.	Physical Assault	5(6.1%)	2(2.4%)	7(8.5)	

RTA; Road traffic accident

Table 2: Effect of associated pathology, the time interval from injury to surgical intervention, GCS on admission & pupillary abnormalities on the outcome (mortality) of patients operated on for ASDH.

Associated Pathology		Alive	Expired	Total	
1.	Contusions	9(11%)	14(17.1%)	23(28%)	P Value=0.109
2.	EDH	5(6.1%)	3(3.7%)	8(9.8%)	
3.	SAH	4(4.9%)	1(1.2%)	5(6.1%)	
4.	Pneumocephalus	2(2.4%)	0(0%)	2(2.4%)	
5.	DSF	2(2.4%)	1(1.2%)	3(3.7%)	
6.	Pneumothorax	0(0%)	1(1.2%)	1(1.2%)	
7.	Femure Fracture	0(0%)	1(1.2%)	1(1.2%)	
Time Interval from Injury to Surgical Intervention		**Alive**	**Expired**	**Total**	
1.	<4 Hours	24(29.2%)	7(8.5%)	31(37.8%)	P Value=0.02
2.	4-8 Hours	20(24.3%)	15(18.2%)	35(42.6%)	
3.	>8 Hours	6(7.3%)	10(12.1%)	16(19.5%)	
GCS on Admission		**Alive**	**Expired**	**Total**	
1.	3-8	14(17.1%)	29(35.4%)	43(52.4%)	P Value=0.000 (statistically significant)
2.	9-12	27(32.9%)	3(3.7%)	30(36.6)	
3.	13-15	9(11%)	0(0%)	9(11%)	
Pupillary Abnormalities		**Alive**	**Expired**	**Total**	
1.	Normal	35(42.7)	6(7.3%)	41(50%)	P Value=0.000 (statistically significant)
2.	One full dilated & non-reactive	0(0%)	4(4.9%)	4(4.9%)	
3.	One mid dilated & reactive	8(9.8%)	1(1.2%)	9(11%)	
4.	One mid-dilated but non-reactive	5(6.1%)	3(3.7)	8(9.8%)	
5.	Both dilated, non-reactive	1(1.2%)	18(22%)	19(23.2%)	
6.	Both dilated, but reactive	1(1.2%)	0(0%)	1(1.2%)	

GCS; Glasgow coma scale, EDH; Extradural hematoma, SAH; subarachnoid hemorrhage, DSF; Depress skull fracture

on axial CT scan slice requires urgent surgical intervention regardless of GCS.[21,22] If the hematoma width is less than 1cm and the midline shifts under 5mm then other factors including

GCS, pupillary abnormalities, or ICP should be considered to deciding on surgical intervention. The prognosis of acute subdural hematoma may depend upon the aforementioned factors following surgical intervention. A lot of studies have been done in the past to determine various prognostic factors that have a noteworthy impact on the outcome of acute subdural hematoma. This study aims to know the mortality and to determine the various prognostic factors that alter the prognosis of patients who underwent surgical evacuation of acute subdural hematoma.

Table 3: Effect of hematoma thickness (mm) and midline shift on outcome of the patients operated for ASDH.

Hematoma Thickness		Alive	Expired	Total	
1.	<10mm	2(2.4%)	0(0%)	2(2.4%)	P Value=0.000 (statistically significant)
2.	11-15mm	47(57.3%)	21(25.6%)	68(82.9%)	
3.	16-25mm	1(1.2%)	11(13.4%)	12(14.6%)	
Midline Shift		**Alive**	**Expired**	**Total**	
1.	6-10mm	46(56.1%)	7(8.5%)	53(64.6%)	P Value=0.000 (statistically significant)
2.	11-15mm	3(3.7%)	19(23.2%)	22(26.8%)	
3.	>15mm	1(1.2%)	6(7.3%)	7(8.5%)	

ASDH; Acute subdural hematoma, mm; millimeter

As previously mentioned, ASDH is highly lethal with mortality ranging from 40-90%.[19,20] Some studies reported a mortality of 30.49%.[7] We observed a mortality rate of 39.2%. This mortality rate is similar to those reported by previous studies; however, it is slightly higher than those reported by a small number of studies. This may be due to a lack of specialist neurosurgical care centers in the periphery which may result in delayed presentation with further deterioration and increased time interval from injury to commencement of surgical intervention. Furthermore, all cases included in this study were operated on and assisted by neurosurgical trainees which might be a contributing factor to slightly higher mortality.

Our study assessed multiple predictive factors that can affect the outcome of patients operated for ASDH including, gender, age, trauma mechanism, related lesions either intra or extra-cranial resulting from the same event, pre-existing comorbidities, GCS at presentation, pupillary abnormalities, hematoma width and midline shift on CT scan. Mortality in males was 29.2% and in females was 9.7% similar to those reported by Gunjkar et al,[7] However; this difference was not statistically significant. Mortality below 40 years of age was 22%, between 41-60 years of age was 11%, and above 60 years of age was 6.1%. The difference in mortality among different age groups was not statistically significant. The age-wise mortality rate of this study is different from those observed by Gunjkar et al, who reported high mortality in patients aged greater than 60 years.[7] Yilmaz et al,[11] also reported higher mortality among older patients. Cerebral contusion was the most common associated lesion we observed, followed by extradural hematoma, however, the impact on mortality was not statistically significant. A study by Leitgeb et al,[12] reported higher mortality in patients with additional traumatic lesions. Similar results were also observed by Kaptanoglu et al.[13]

The time interval between injury and surgical intervention for acute subdural hematoma is a strong predictor of outcome. We noted that patients with acute subdural hematoma evaluated within 4 hours of head injury have significantly better outcomes compared to those operated after 4 hours (8.5% vs. 18.2% mortality)(P=0.02). Seelig et al, in their study, also reported that patients operated on within 4 hours had an enhanced survival rate of 90% compared to those operated on after 4 hours (30%).[23] A study by Altaf et al,[24] did not find a relationship between the timing of surgical intervention and outcome

following the evacuation of ASDH.

GCS on presentation to the neurosurgical care unit is one of the most significant predictors of outcome in patients operated on for ASDH.[25] Level of GCS represents extant brain damage and provides information on survival during follow-up.[26] we found a significant correlation between GCS on presentation and outcome in terms of mortality. In our study, we noted an inverse relationship between GCS at presentation and mortality. 29(39.4%) out of 43 patients died when their GCS was below 8, while none of them died when their GCS was greater than 12. Igbokwe et al,[26] reported a mortality of 73% in patients with GCS of less than 8. Pupillary abnormalities at the time of presentation have a strong impact on the outcome of patients operated for ASDH. Prahaldu et al, reported a mortality of 10% in patients with normal pupils, 24% for single papillary dilatation, and 100% for bilateral pupillary dilation.[27] We found that patients with increased pupillary diameter and or impaired response to light have significantly higher mortality (31.9%) compared to those with normal pupillary diameter and response (7.3%). In our study, only 1 out of 19 patients with bilateral dilated pupils survived.

Current guidelines recommend surgical intervention for evacuation of ASDH with a width greater than 1cm or midline shift greater than 5mm regardless of GCS.[28] Petridis et al found a significant correlation between midline shift and Glasgow outcome scale at the time of discharge.[29] Akbik et al,[30] found hematoma thickness but not midline shift, to be associated with Glasgow outcome score at the time of discharge. We found a statistically significant correlation between hematoma thickness, midline shift, and outcome in terms of mortality. Only one patient in our study survived when hematoma thickness and midline shift exceeded greater than 15mm.

CONCLUSION

GCS at presentation, normal or abnormal pupils, hematoma width, size of midline shift, and the time interval from injury to surgical intervention are important predictors for outcome in surgically treated posttraumatic acute subdural hematoma. GCS greater than 9, normal pupils, hematoma width less than 1cm, midline shift less than 10 mm, and early surgical intervention within 4 hours of injury is significantly associated with better outcomes. Age, gender, associated lesions, and presence of comorbidities do not correlate with the outcome (Mortality) of patients who undergo decompressive craniectomy for acute subdural hematoma.

RECOMMENDATIONS

Clinicians should prioritize the early evaluation of patients who develop an acute subdural hematoma, paying close attention to the Glasgow Coma Scale (GCS) at presentation. When possible, surgical intervention within 4 hours of injury should be considered as it is strongly associated with better outcomes.

REFERENCES

1. Lavrador JP, Teixeira JC, Oliveira E, Simão D, Santos MM, Simas N. Acute Subdural Hematoma Evacuation: Predictive Factors of Outcome. Asian J Neurosurg. 2018;13(3):565-71.
2. Prahaladu P, Prasad KS, Rajashekar B, Reddy KS. Clinical study of acute subdural haematoma – a level I trauma care centre experience. International Journal of Research in Medical Sciences, 2017;5(3):857-62.
3. Karibe H, Hayashi T, Hirano T, Kameyama M, Nakagawa A, Tominaga T. Surgical management of traumatic acute subdural hematoma in adults: a review. Neurologia Medico Chirurgica. 2014;54(11):887-94.
4. Marbacher S, Fandino J, Lukes A. Acute subdural hematoma from ruptured cerebral aneurysm. Acta Neurochir (Wien). 2010;152(3):501–7.

5. Howard MA, Gross AS, Dacey RG, Winn HR. Acute subdural hematomas: an age dependent clinical entity. Journal of Neurosurgery, 1989;71(6):858-863.
6. Alvis-Miranda H, Castellar-Leones SM, Moscote-Salazar LR. Decompressive Craniectomy and Traumatic Brain Injury: A Review. Bull Emerg Trauma. 2013;1(2):60–8.
7. Gunjkar J, Vohra SS, Gupta A. Prognostic factors in operated cases of acute subdural hematoma. International Journal of Contemporary Medicine Surgery and Radiology, 2019;4(3):C52-C56.
8. Karibe H, Hayashi T, Hirano T, Kameyama M, Nakagawa A, Tominaga T. Surgical management of traumatic acute subdural hematoma in adults:a review. Neurol Med Chir (Tokyo) 2014;54(11):887–94.
9. Alagoz F, Yildirim AE, Sahinoglu M, Korkmaz M, Secer M, Celik H, et al. Traumatic Acute Subdural Hematomas: Analysis of Outcomes and Predictive Factors at a Single Center. Turk Neurosurg. 2017;27(2):187–91.
10. Shen J, Pan JW, Fan ZX, Zhou YQ, Chen Z, Zhan RY. Surgery for contralateral acute epidural hematoma following acute subdural hematoma evacuation: five new cases and a short literature review. Acta Neurochir (Wien). 2014;8(155):335–41.
11. Yılmaz İ, Ertem DH, Kılıç M, Altaş K, Mirhasilova M, Özdemir B, et al. Factors associated with mortality in acute subdural hematoma: Is decompressive craniectomy effective? Ulus Travma Acil Cerrahi Derg. 2019;25(2):147-153.
12. Leitgeb J, Mauritz W, Brazinova A, Janciak I, Majdan M, Wilbacher I, et al. Outcome after severe brain trauma due to acute subdural hematoma. J Neurosurg. 2012;117(2):324–33.
13. Kaptanoğlu E,Solaroğlu I, Uçar MD, Okutan MO, Beşkonakli E, Taşkin Y. Acute subdural hematomas: surgical treatment. Retrospective analysis of 73 case. Ulus Travma Derg. 2001;7(4):246–9.
14. Carney N, Totten AM, O'Reilly C, Ullman JS, Hawryluk GW, Bell MJ, et al. Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition. Neurosurgery, 2017;80(1):6–15
15. Walcott BP, Khanna A, Kwon CS, Phillips HW, Nahed BV, Coumans JV. Time Interval to Surgery and Outcomes Following the Surgical Treatment of Acute Traumatic Subdural Hematoma. Journal of Clinical Neuroscience, 2014;21(12):2107–11.
16. Kwon YS, Yang KH, Lee YH. Craniotomy or Decompressive Craniectomy for Acute Subdural Hematomas: Surgical Selection and Clinical Outcome. Korean J Neurotrauma, 2016;12(1):22-27.
17. Elshanawany AM, Essa AA. Traumatic Acute Subdural Hematoma: Treatment by Evacuation with Decompressive Craniotomy and Cranioplasty, Case Series and Surgical Outcome Analysis. Open J Mod Neurosurg. 2018; 8(3):331-41.
18. Monsivais D, Huimahn A Choi, Ryan K, Franch M, Cai C. A retrospective analysis of surgical outcomes for acute subdural hematoma in an elderly cohort. Interdiscip Neurosurg. 2018;14:130-34.
19. Lavrador JP, Teixeira JC, Oliveira E, Simao D, Santos MM, Simas N. Acute Subdural Hematoma Evacuation: Predictive Factors of Outcome. Asian J Neurosurg. 2018;13(3):565-71.
20. Lee D, Song SW, Choe WJ, Cho J, Moon CT, Koh YC. Risk Stratification in Patients with Severe Traumatic Acute Subdural Hematoma. The Nerve, 2017;3(2):50-57.
21. Karnjanasavitree W, Phuenpathom N, Tunthanathip T. The Optimal Operative Timing of Traumatic Intracranial Acute Subdural Hematoma Correlated with Outcome. Asian J Neurosurg. 2018;13(4):1158-64.
22. Bullock MR, Chesnut R, Ghajar J, Gordon D, Hartl R, Newell DW, et al. Surgical management of acute subdural hematomas. Neurosurgery, 2006;58(Suppl 3):S16-S24.
23. Seelig JM, Becker DP, Miller JD, Greenberg RP, Ward JD, Choi SC. Traumatic acute subdural hematoma: major mortality reduction in comatose patients treated within four hours. N Engl J Med. 1981;304(25):1511-18.
24. Altaf I, Shams S, Vohra AH. Role of surgical modality and timing of surgery as clinical outcome predictors following acute subdural hematoma evacuation. Jkop[Pak J Med Sci. 2020;36(3):412-15.
25. Elhawary MA, El Shokhaiby UM, Ali WE, Gafar AM, Abd El Rahman AA. Factors affecting the prognosis of traumatic acute subdural hematomas. Sci J Al-Azhar Med Fac Girls, 2019;3(1):246–251.
26. Igbokwe KK, Ayogu OM, Onobun DE, Essiet EA, Ugwuanyi UC. The Outcomes of Traumatic Acute

Subdural Hematoma in a Tertiary Center in Abuja, Nigeria. Cureus, 2021;13(11):e20016.
27. Prahaladu P, Prasad KS, Rajasekhar B, Reddy KS. Clinical study of acute subdural haematoma – a level I trauma care centre experience. International Journal of Research in Medical Sciences. Int J Res Med Sci. 2017;5(3):857-62.
28. Bullock MR, Chesnut R, Ghajar J, Gordon D, Hartl R, Newell DW, et al. Surgical Management of Traumatic Brain Injury Author Group. Surgical management of acute subdural hematomas. Neurosurgery, 2006;58(3 Suppl):S16-24.
29. Petridis AK, Dörner L, Doukas A, Eifrig S, Barth H, Mehdorn M. Acute subdural hematoma in the elderly; clinical and CT factors influencing the surgical treatment decision. Cent Eur Neurosurg. 2009;70(2):73-8.
30. Akbik OS, Starling R, Green R, Zhu Y, Lewis J. Delayed Surgical Intervention in Acute Subdural Hematoma. Cureus, 2020;12(11):e11592.

Additional Information

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Human Subjects: Consent was obtained by all patients/participants in this study.
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AUTHOR CONTRIBUTIONS

Sr. No.	Author's Full Name	Intellectual Contribution to Paper in Terms of
1.	Shah Khalid & Amer Zaman	Study Design, Methodology, and Paper Writing
2.	Waseefullah & Amer Zaman	Data Calculation and Data Analysis
3.	Shah Khalid	Interpretation of Results
4.	Faiza & Waseefullah	Statistical Analysis
5.	Abdul Majid khan	Literature Review and Quality Insurer