FREQUENCY OF SIGNIFICANT RESOLUTION OF ELEVATED ST SEGMENT AFTER THROMBOLYSIS IN STEMI PATIENTS

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Author's Contribution

MS:Conducted the study and wrote the article. MI: Helped in review the article. AS: Re-arranged data and corrected article. SMB: Tables and figures. RA and SAA made corrections and did the proof reading.

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ABSTRACT

OBJECTIVE: To determine the frequency of achievement of more than 50% resolution of elevated ST segment after Streptokinase (SK) thrombolysis among acute ST elevation myocardial infarction (STEMI). This study will also determine the significant associations of this resolution of ST segment with different qualitative and quantitative factors.

MATERIAL AND METHODS : This cross-sectional analysis included STEMI patients who were treated with Streptokinase thrombolysis at the Department of Cardiology, GMC Teaching hospital, Gujranwala. ST segment elevation was noted in millimeter (mm) before and after SK, and patients were categorized into 2 groups, one who achieved and second who did not achieve more than 50% resolution in the elevated ST segment after SK. Statistical analysis was done using SPSS version 25. Independent sample T test, Chi-square test, and binary logistic regression analysis were applied. The p-values were taken statistically significant if < 0.05.

RESULTS : Amongst 668 patients, 78% achieved more than 50% resolution in elevated ST segment after SK. The group of patients whose ST segment settled more than 50% had statistically significantly less BMI (p=0.013) and less serum creatinine level (p=0.002). Elevated ST segment resolution was significantly more common in non-diabetic patients (p<0.01), in patients with personal history of IHD (p<0.01), in patients without history of IHD in male family member of age <55years (p=0.029), and in patients without right ventricular involvement (p<0.01). As compared to the patients who survived, all the patients who died had no more than 50% ST resolution (p<0.01). The binary logistic regression model explained 26.5% (NagelkerkeR2) of the variance in elevated ST segment resolution and correctly classified 82.6% of cases. Patients with personal history of IHD were 3.338 times more likely to exhibit ST resolution. Non-diabetic patients, patients without history of IHD in male family member of age less than 55years, and patients withoutright ventricular involvement had significantly more chance of resolution of elevated ST segment.

CONCLUSION: Majority of patients achieved more than 50% resolution of elevated ST segment after streptokinase.

KEYWORDS: Acute STEMI, ST segment elevation, Streptokinase, SPSS.

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INTRODUCTION

Acute ST-elevation myocardial infarction (STEMI) is defined by ischemic cardiac pain, rise in cardiac enzymes like troponin level, and elevation of ST segment on electrocardiogram (ECG).[1] It accounts for up to 40% of all acute coronary syndrome hospital admissions.[2] It occurs when thrombus completely occlude major epicardial coronary vessel, resulting transmural ischemia.[3] The annual incidence of acute MI is 1.1-1.7% in USA,[4] while 6.44% in subcontinent.[5] Streptokinase thrombolysis is frequently used in our country in acute STEMI patients due to deficient availability of emergent angiography suite and expertise. In STEMI, the injury current flowing from depolarized ischemic region to normal region results in elevation of ST segment.[6] ST-segment changes reflect myocardial rather than epicardial flow and hence yield prognostic information beyond that provided by coronary angiogram alone.[7] Numerous studies have shown a remarkably consistent relationship between the degree of ST resolution and subsequent survival.[8,9] Young age, no hypertension, and inferior cardiac wall involvement are the known positive predictors for resolution of elevated ST segment after thrombolysis or reperfusion.[10,11,12] These majority literature findings were from the Western population, local studies focusing such elaborations from Pakistan are lacking. Therefore, the objective of the present study was to determine the frequency of achievement of >50% resolution of elevated ST segment after Streptokinase (SK) thrombolysis among acute ST elevation myocardial infarction (STEMI). This study will also determine the significant associations of this resolution of ST segment with different qualitative and quantitative factors.

MATERIAL AND METHODS:

This cross-sectional analysis was done from June 2017 to May 2018 at the Department of Cardiology, GMC Teaching hospital, Gujranwala. The data was collected by purposive sampling. The patients admitted with STEMI of all age groups, belonging to both genders, who were treated with intravenous Streptokinase were included in the study. ST segment elevation was noted in millimeter (mm) in STEMI patients before and after SK. These patients were categorized into two groups, one who achieved and second who did not achieve >50% settlement in the elevation of ST segment after SK.

Statistical analysis was performed using the Statistical Package for Social Science (SPSS), version 25. Age, BMI, door to needle time in minutes, time from onset of symptoms till arrival at hospital in minutes, systolic BP at presentation, diastolic BP at presentation, baseline pulse, serum sodium, potassium and creatinine concentration were the quantitative variable, while gender, ST segment settlement >50% at first post-admission day, history of smoking, hypertension, diabetes mellitus, personal history of IHD, history of IHD in female family member of age <45years, history of IHD in male family member of age <55years, cardiac wall involved by STEMI, obesity, outcome of hospitalization, and right ventricular involvement were qualitative variables. Independent sample T test[13] and Chi-square test for independence[14] were used for quantitative and qualitative variables respectively to determine their significant association with settlement of ST segment elevation. Then, binary logistic regression analysis[15] was also performed. The p-values were taken statistically significant if < 0.05.

RESULTS:

Amongst 668 STEMI suffering patients who received SK, >50% ST segment elevation got settled at first post-admission day after SK in 78% (n=527) patients while >50% ST segment did not settle in 21.1% (n=141) patients (Picture 1). As compared to group of patients whose ST segment did not settle >50%, the group of patients whose ST segment settled >50% had statistically significantly less BMI (53.50 ± 11.98kg/m² vs 54.97 ± 13.69kg/m² , p=0.013) and less serum creatinine

Table-1: Associations of various quantitative variables with ST segment elevation settlement more than 50% at first post-admission day after Streptokinase among STEMI patients (n = 668) *

| Quantitative variables | ST elevation settled >50% at 1st post-admission day | | Mean difference | p-value |
	Yes (mean + SD)	No (mean + SD)		
Age (years)	53.50 ± 11.98	54.97 ± 13.69	-1.47	0.210
BMI (Kg/m²)	26.85 ± 4.04	27.83 ± 4.51	-0.98	0.013
Time till arrival (minutes)¹	285.39 ± 377.21	252.62 ± 260.66	32.77	0.332
Door to needle time (minutes)	28.08 ± 36.62	26.35 ± 32.72	1.73	0.611
Baseline pulse (per minute)	86.08 ± 19.36	85.60 ± 17.80	0.48	0.790
Baseline systolic BP (mmHg)	131.93 ± 26.25	128.82 ± 26.29	3.11	0.212
Baseline diastolic BP (mmHg)	82.25 ± 16.44	83.69 ± 22.60	-1.44	0.396
Serum creatinine	1.07 ± 0.41	1.31 ± 1.57	-0.24	0.002

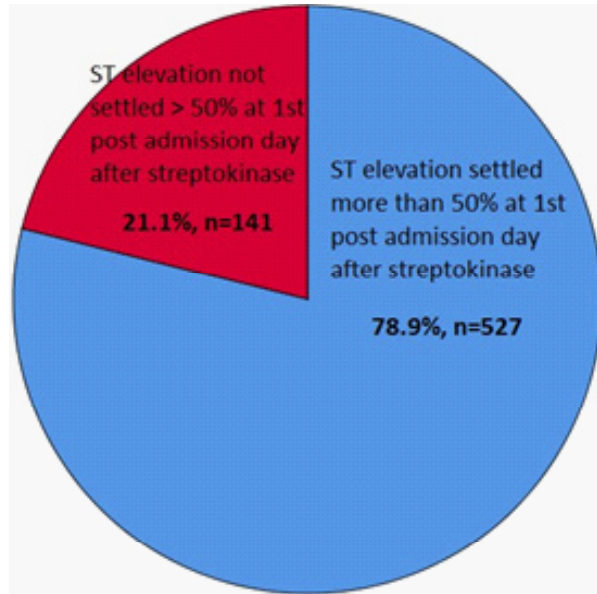*Independent sample T-test was used; 1=Time from onset of symptoms till arrival at hospital (minutes)

level (1.07 ± 0.41mg/dl vs 1.31

± 1.57 mg/dl, p=0.002) (Table 1).

ST segment elevation settlement >50% at first post-SK day was seen statistically significantly more common in non-diabetic patients (p<0.01), in patients with personal history of IHD (p<0.01), in patients without history of IHD in male family member of age <55years (p=0.029), and in patients

Table 2: Association between qualitative factors and ST segment elevation settlement more than 50% at first post-admission day after Streptokinase among STEMI patients (n = 668) *

Predictors / Factors	ST elevation settled >50% at 1st post-admission day		Total	p-value
	Yes	No		
Gender:				
Male	406 (77%)	109 (58.2%)	515 (77.1%)	0.523
Female	121 (23%)	32 (22.7%)	153 (22.9%)	
History of smoking:				
Yes	280 (53.1%)	82 (58.2%)	362 (54.2%)	0.279
No	247 (46.9%)	59 (41.8%)	306 (45.8%)	
History of diabetes mellitus:				
Yes	141 (26.8%)	56 (39.7%)	197 (29.5%)	<0.01
No	386 (73.2%)	85 (60.3%)	471 (70.5%)	
History of hypertension:				
Yes	277 (52.6%)	84 (59.6%)	361 (54%)	0.154
No	250 (47.4%)	57 (40.4%)	307 (46%)	
Personal history of IHD:				
Yes	168 (31.9%)	25 (17.7%)	193 (28.9%)	<0.01
No	359 (68.1%)	116 (82.3%)	475 (71.1%)	
History of IHD in male family member of age <55years:				
Yes	56 (10.6%)	25 (17.7%)	81 (12.1%)	<0.029
No	471 (89.4%)	116 (82.3%)	587 (87.9%)	
History of IHD in female family member of age <45years:				
Yes	64 (12.1%)	7 (12.1%)	81 (12.1%)	1.000
No	463 (87.9%)	124 (87.9%)	587 (87.9%)	
Obesity:				
Yes	113 (21.4%)	40 (28.4%)	153 (22.9%)	0.091
No	414 (78.6%)	101 (71.6%)	515 (77.1%)	
Cardiac wall involved by STEMI:				
Inferior wall	239 (45.4%)	53 (37.6%)	292 (43.7%)	0.105
Other walls	288 (54.6%)	88 (62.4%)	376 (56.3%)	
Right ventricular involvement:				
Yes	28 (5.3%)	25 (17.7%)	53 (7.9%)	<0.01
No	499 (94.7%)	116 (82.3%)	615 (92.1%)	
Outcome of hospitalization:				
Death	0 (0%)	25 (17.7%)	25 (3.7%)	<0.01
No death	527 (100%)	116 (82.3%)	643 (96.3%)	

Distribution of ST segment elevation settlement more than 50% at 1st post-admission day among STEMI patients who received streptokinase (n=668)

Table 3: Binary Logistic Regression Analysis to predict association of various factors with ST segment elevation settlement >50% at 1stpost-admission day among STEMI patients who received Streptokinase (n = 668) *

Risk Factors	B	S.E.	Wald-Statistic	p-value	Odds Ratio	95% C.I. for EXP(B)	
						Lower	Upper
1. Age (years)	0.007	0.009	0.580	0.446	1.007	0.990	1.024
2. Gender (Male/Female)	0.184	0.253	0.530	0.467	1.202	0.732	1.973
3. BMI (Kg/m^2)	-0.009	0.026	0.127	0.722	0.991	0.941	1.043
4. Serum creatinine (mg/dl)	0.208	0.122	2.932	0.087	0.087	0.970	1.563
5. History of diabetes mellitu (Yes/No)	-0.453	0.227	3.975	0.046	0.636	0.407	0.992
6. Personal history of IHD (Yes/No)	1.205	0.305	15.618	<0.01	3.338	1.836	6.068
7. History of IHD in male family member of age <55years (Yes/No)	-0.826	0.343	5.802	0.016	0.438	0.224	0.857
8. Right ventricular involvement (Yes/No)	-1.020	0.355	8.277	<0.01	0.361	0.180	0.722
9. Outcome of hospitalization (Death/No death)	22.92	7483.45	0.000	0.998	899838190	0.00	
Constant	-0.887	1.009	0.772	0.380	0.412		

without right ventricular involvement (p<0.01). As compared to the patients who survived, all the patients who died had no ST segment elevation settlement >50% at 1stpost-SK day (p<0.01) (Table 2).

A binary logistic regression analysis was performed to ascertain the effect of different qualitative and quantitative factors on the likelihood that participants have ST segment elevation settlement >50% at first post-SK day. The logistic regression model explained 26.5% (NagelkerkeR2) of the variance in ST segment elevation settlement >50% at first post-SK day and correctly classified 82.6% of cases. Patients with personal history of IHD were 3.338 times more likely to exhibit ST segment elevation settlement

>50% at first post-admission day after SK. Non-diabetic patients, patients without history of IHD in male family member of age <55years, and patients without right ventricular involvement had significantly more chance of ST segment elevation settlement (Table 3).

DISCUSSION:

In our study majority patients (78.9%) achieved >50% resolution in elevated ST segment after SK thrombolysis. Ultas Jajoo et al[16] from central India observed ischemic pain relief in 78% patients, while ST segment resolution (complete or partial) in only 39% patients after SK thrombolysis. Due to unavailability of emergency angiography facility at majority places, SK thrombolysis is widely used in Pakistan. Secondly, Indian authors cannot ascertain a correlation between door to needle time and ST segment resolution. Similar was in our data where BMI and serum creatinine were significantly less in ST segment resolution group while association between door to needle time and ST segment resolution was insignificant. Mehta Nirav J. et al[10] found younger age as a predictor of resolution of elevated ST segment after thrombolytic therapy. They observed less resolution in elders. In our data, increasing age had no association with ST segment resolution (p=0.446). Guzman[11] found inferior cardiac wall involvement as positive predictor of resolution of elevated ST segment after SK thrombolysis as compared to anterior cardiac wall involvement. So-Ra- Park[12] found history of hypertension (p=0.004), anterior cardiac wall involvement (p=0.002), and higher cardiac enzymes levels (p<0.01) as predictors of incomplete ST segment resolution after cardiac reperfusion. In our study, we also categorized patients into whose inferior wall involved and second whose

other than inferior wall was involved by myocardial infarction. There was no statistically significant association of cardiac wall involvement by STEMI and >50% resolution of elevated ST segment after SK (p=0.105). Similarly, in our data hypertension had no association with ST resolution (p=0.154). However, we ascertained a negative association of diabetes mellitus with resolution of elevated ST segment (p<0.01). Varshit Hathi et al[17] found more ST resolution among non-diabetics (96.8%) compared to diabetic patients (83.6%). Sameer Saleem[18] also documented poor post-thrombolytic resolution of elevated ST segment among diabetics in comparison to among non-diabetics.

Shuja-ur-Rehman[19] studied link between resolution of elevated ST segment after thrombolysis with the time from onset of chest pain to SK administration. Thrombolysis within 1hr, at 2hr, at 3hr and at >4hr after onset of symptoms achieved ST resolution in 93%, 72%, 62%, and 0% patients respectively. However, our data was suggestive of no significant association of >50% ST resolution with time from onset of symptoms till arrival at hospital (p=0.332) and door to needle time (p=0.611). Rolf K. Schröder and his colleagues[20] found that non-resolution of elevated ST segment was the most influential predictor of mortality (p = 0.0001). Similarly, Satish Kinagi and Mahesh[21] concluded that no resolution of ST segment after thrombolysis had higher mortality when compared to patients with partial and complete ST segment resolution. Our findings were in concordance to other studies where mortality was 17.7% in group of patients without ST resolution at first post-SK day while mortality was nil in group of patients with ST resolution at first post-SK day. Our study had a lot of information and findings. The patients with personal history of IHD, without history of IHD in male family member of age <55years, and without right ventricular involvement also showed significantly more resolution of elevated ST segment. Further studies with large sample size may be done for detailed elaboration.

The study limitations were that this study should be carried out over a larger populations, in multiple centers and SK should be compared with other thrombolytic agents.

CONCLUSION:

Majority of patients achieved more than 50% resolution of elevated ST segment after streptokinase. This may be used as a useful option for revascularization in patients with STEMI where Cath Lab facility is not available.

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