Original Contribution

Association of educational level with delay of prehospital care before reperfusion in STEMI[☆,☆☆]

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ABSTRACT

Study objective: Rapid access to reperfusion is important in ST-segment elevation myocardial infarction (STEMI). The goal of this study is to assess the association of the educational level of patients with STEMI and prehospital and inhospital delay before reperfusion.
Methods: We used a nationwide database of 31 emergency departments for cardiovascular disease surveillance operated by the Korean Centers for Disease Control and Prevention. ST-segment elevation myocardial infarction cases registered from November 2007 to December 2012 were enrolled. Cases younger than 18 years old or missing educational history were excluded. Educational level was characterized as low (completion of elementary school or less), medium (completion of middle or high school), and high (completion of a bachelor's degree or higher). We compared prehospital and inhospital delay for 3 educational groups. A general linear regression was used to assess the association of educational level with the time from symptom to hospital arrival.
Results: A total of 9028 patients with STEMI were included. The median time from symptom to hospital arrival was 144, 76, and 68 minutes in the low, medium, and high education groups, respectively ($P < .01$). Educational level had no significant effect on the door-to-balloon time. Low and medium education groups experienced significant delays of symptom to hospital to high education group (low: $\beta = 27.2$ minutes; 95% confidence interval, 15.9-38.5; medium: $\beta = 19.1$ minutes; 95% confidence interval, 15.9-38.5).
Conclusion: In patients with STEMI, the time from symptom to hospital arrival increased as educational level decreased, but educational level had no significant association with the inhospital delay to reperfusion.

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1. Introduction

1.1. Background

Acute myocardial infarction (AMI) is a leading cause of death in advanced countries [1]. Despite improvements in the care and outcomes of patients with ST-segment elevation myocardial infarction (STEMI) in recent years, STEMI remains a major cause of death [2]. Early access to reperfusion therapy significantly improves the prognosis of patients with STEMI. The inhospital and long-term outcomes of patients with STEMI are adversely affected by delayed reperfusion due to prolonged prehospital time and inhospital time [3-5].

Measures of socioeconomic status (SES) including educational level are important prognostic factors in patients who experience AMIs including STEMIs [6-16]. In the last 2 decades, many investigators have reported a positive relationship between favorable AMI outcome and higher SES in advanced societies [17-20]. A recent study indicated that low educational level, symptom onset during the night time, and triage via other hospitals were associated with prolonged prehospital time [21].

The time from symptom onset to reperfusion therapy can be divided into several intervals, such as symptom onset to emergency medical services (EMS) call, EMS call to scene arrival, scene arrival to hospital arrival, emergency department (ED) arrival to electrocardiogram (ECG) check, and ECG check to reperfusion therapy. Recognition of the causes of delays during each interval and implementation of strategies to reduce these delays is needed to reduce the overall delay of access to reperfusion therapy. For example, community health education is necessary to reduce the time from symptom onset to calling of EMS,

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and a hospital-based critical pathway and quality improvement are required to reduce the door-to-balloon time.

1.2. The goal of this investigation

The goal of the investigation was to identify the association between patient educational level and the delay of each interval of the prehospital and inhospital times before reperfusion. Our purpose was to develop an effective strategy to reduce the overall delay from onset of STEMI symptoms to reperfusion time.

2. Materials and methods

2.1. Study design

This study is prospective observational study that used the ED-based nationwide cardiovascular disease surveillance system operated by the Korean Centers for Disease Control and Prevention. This database has information about cardiovascular patients using the standardized registry in South Korea (Appendix). This study was approved by the institutional review board of the study institution, and the Korean Centers for Disease Control and Prevention approved the data analysis and publication.

2.2. Study setting

Thirty-one EDs of university hospitals in South Korea contributed to the database ("Hospital-based Registration of Cardiovascular Disease in South Korea") from November 2007 to December 2012. The database included all adult patients older than 18 years old who visited an enrolled ED with cardiovascular disease or cerebrovascular stroke. Emergency physicians of each hospital collected data using a standardized registry form. The database included information about demographic characteristics including educational level, clinical outcome

and procedure, and detailed time profiles of the prehospital and inhospital periods. The prehospital times were collected from EMS runsheets, and the inhospital times were collected from hospital medical records. During the study period, the Korean Centers for Disease Control and Prevention regularly researched and conducted a quality assessment program.

2.3. Selection of participants

Adult patients listed in the database who had diagnoses of STEMI from November 2007 to December 2012 were identified. The ED physicians of the enrolled hospitals performed all final diagnoses. The final diagnoses in the database are categorized as STEMI involving the anterior wall, STEMI involving the lateral or inferior wall, non-STEMI, sudden cardiac death, vasospasm-induced myocardial infarction, bundle-branch block, and others. The definition of STEMI in this study was a STEMI involving the anterior, lateral, or inferior wall. Cases were excluded if the diagnosis was not STEMI, the patient was younger than 18 years old, and if educational level was not recorded (Figure).

2.4. Method of measurement

Each patient's educational level was classified as high (a bachelor's degree or higher), medium (graduated from high school or middle school), or low (graduated from elementary school or no education). The name of each patient's institution(s) and self-reported educational level were entered into the database.

The time profile during emergency care was measured from symptom onset to reperfusion therapy in minutes. This profile was divided into a prehospital time (from symptom onset to arrival at the destination hospital) and inhospital time (from ED arrival to delivery of a medical procedure at the hospital). For patients who used an EMS, the prehospital period was further subdivided into (i) symptom onset
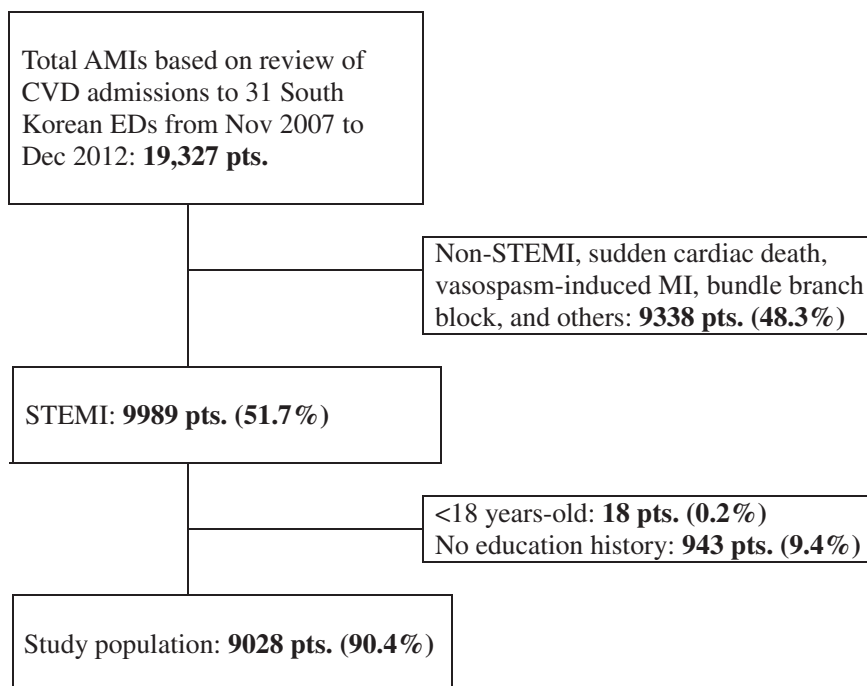
Figure. Screening and selection of patients used to examine the effect of educational level of patients with STEMI on the duration of prehospital and inhospital care.