TITLE : **FINGERPRINT SCAN OF THE DEAD: REAL-TIME VICTIM IDENTIFICATION DURING SEARCH AND RECOVERY IN LARGE SCALE DISASTER**

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Biometric System

Introduction

- The biometric system is an automatic identification that uses unique biological traits such as fingerprint, face, iris, voice, retina, etc.
- Fingerprint biometric system is the most widely used because of its low cost, high matching speed and relatively high matching accuracy.
- This paper demonstrates the possibility to perform Disaster Victim Identification (DVI) on-site with the concept of real-time fingerprint matching of the dead using a mobile and portable fingerprint biometric device where the thumbprint of the dead is readable.
- Immediate identification enhances the DVI process and allows a humanitarian approach to the handling of the dead and their remains, bringing much needed closure to families and their loved ones.

Objective

- To demonstrate the possibility of using a portable biometric reader to capture and to match with a cadaveric fingerprint scan in order to translate into real-time identification in a large scale disaster.

Research Problem

- As a standard practice, dead victims will be collected by the first responders and the police will send them to the mortuary for examination during disaster. By the time the dead victims arrive at the mortuary, evidence that could be used to facilitate identification might have lost due to the transportation and body handling.
- Similarly, the duration of the recovery of the dead bodies could exceed 48 hours and the dead bodies have already started to decompose

Significance

- As there is no current method available to identify dead bodies using biometric reader at disaster site, this study will allow an almost immediate identification for all dead victims before the remains are transported to the mortuary. All victims can be fingerprinted and identified simultaneously within 48 hours' post-disaster with the immediate capture of the biometrics of the dead victims on-site during the search and recovery phase. Thus, there is an opportunity to explore real-time identification using fingerprint scan for the dead during search and recovery phase in large scale disaster.

Methodology

- Study design: Cross-sectional study from 1 January to 31 December 2020
- Pilot study: 18 subjects (1 August to 31 December 2019)
- Material: An optical fingerprint biometric reader called the MorphoSmart model MSO 1350 connected to an android Huawei P9 smartphone device (model EVA L19) via a USB cable where a fingerprint application software version 2.0.7 was installed
- Minimum sample size calculated: 66 subjects (Random sampling method)
- Medical Research Ethical Committee approval: KKM/NIHSEC/P19-1166(12) dated 2 July 2019
- Data protection: Information on MyKad will not be stored in the MorphoSmart device. It is a match-and-display model without data storage capacity

100 Subjects: Death-in-ward (Known time of death) → Arrive at mortuary → Register → MyKad (An identification card for Malaysian citizen aged 12 and above that incorporates both photo identification & fingerprint biometric data on an in-built computer chip) → Consent from next-of-kin →  Fingerprint reader system → Matched or Not matched (Subject's MyKad is matched with own thumbprint to verify the identity) → Body Release

Statistical Analysis: IBM SPSS Version 26.0

- Non-parametric test: Data not normally distributed
- Chi Square: 56 males & 44 females p-value >0.05
- Spearman Correlation: Age group (21-40; 41-60; 61-80; 81-100) p-value >0.05
- Mann-Whitney U Test: Median Postmortem interval 158 minutes p-value >0.05
- Logistic Regression: Gender p-value = 0.080; Age group p-value = 0.052; Postmortem interval p-value = 0.954

Findings

- 52 males & 34 females matched; 4 males & 9 females did not match
- Chi Square: Male & female are equally likely to get a fingerprint match on the biometric scan
- Spearman Correlation: There are no significant relationship between age group and result output of the biometric scan
- Mann-Whitney U Test: No significant differences in postmortem interval and result output of the biometric scan
- Logistic regression: The relationship between 3 variables (gender, age group & postmortem interval) that may be contributing factor to affect the result output of the scan are not significant. It supports the assumption that fingerprint biometric reader device and its application which has been used for the living can also be used for the dead.

Discussion

- Fingerprint comparison is the fastest method and most reliable means of primary identification in Disaster Victim Identification (DVI) work.
- This study proves that fingerprint identification for the dead yield the same results as it does for the living.
- The 'Golden 48 hours' Rule, which is the first 48 hours' post-disaster before the decomposition process commences is of ultimate value in DVI work where fingerprint can be documented and prevented from loss
- A robust and portable fingerprint device and its application can be made suitable for first responders to retrieve fingerprint information for rapid identification at disaster site
- Capturing real-time cadaveric fingerprints could be an addition to the field manual for first responders in management of the dead

Limitation

MorphoSmart model is only applicable to read Malaysian MyKad. Foreigners are excluded from the study where victims of an actual mass fatality incident usually comprised of a mixture of nationalities.

Conclusion

Retrieval of victim identity can be enhanced through the in-situ fingerprint matching at the disaster site which could be included as part of the humanitarian forensic response. With a proper mobile fingerprint biometric reader device given to first responders, the conventional fingerprinting process in the mortuary can be brought forward to the Scene phase to allow preservation of identity.