

# **Sex identification of the Egyptian population using mandibular CBCT scans**

## **“A retrospective study”**

Thesis

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# **Dedication**

*I would like to thank my dear family for their continuous support, patience, and encouragement.*

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## List of abbreviations

<u>Item</u>	<u>Abbreviation</u>
<b>CBCT</b>	Cone Beam Computerized Tomography
<b>2D</b>	Two Dimensional
<b>3D</b>	Three Dimensional
<b>FOV</b>	Field Of View
<b>ALARA</b>	As Low As Reasonably Achievable
<b>IIS</b>	Image Intensifier Screen
<b>CCD</b>	Charge Coupled Device
<b>FPD</b>	Flat Panel Detector
<b>DICOM</b>	Digital Imaging And Communication in Medicine
<b>ROI</b>	Region Of Interest
<b>RL</b>	Ramus Length
<b>GA</b>	Gonial Angle
<b>GGI</b>	Gonion Gnathion Length
<b>BH canine</b>	Body Height at canine
<b>BH 1<sup>st</sup> molar</b>	Body Height at 1 <sup>st</sup> molar
<b>BigBr</b>	Bigonial Breath
<b>BicBr</b>	Bicondylar Breadth

<b>MPR</b>	Multi Planar Reformatted images
<b>MRBr</b>	Minimum Ramus Breadth

## **Introduction and review of literature**

Identity is defined as a group of characteristics that mark each human being. Those characteristics gave each human a unique entity (**Iscan 2001**). In other words, identification means comparing different details of human and searching for similarities based on previous database (**Alves and Haiter et al. 2016**).

Sexual Prediction was one of the basic parameters in forensic medicine used for identification of missing or severely deteriorated personnel. Unique morphologic and morphometric characteristics of sexual identification have been detected in different countries including: Europe, China, Japan and the United States of America (**Iscan 2001**) (**Alves and Haiter et al. 2016**).

Skull bones had the privilege of being very dense and were hardly destructible (**Holland 1989**) (**Gamba and Haiter et al 2016**), thus Skull parts such as mandible could be of high diagnostic value if circumstances allowed to be well preserved (**Saini et al. 2011**) (**Alves and Haiter et al. 2016**).

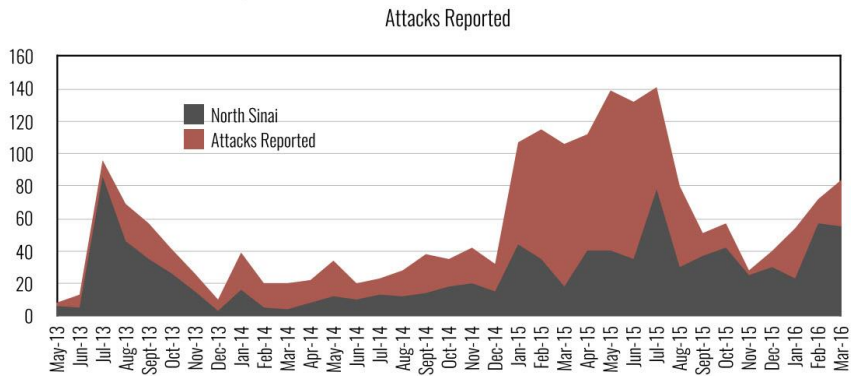
Nonetheless to say, our Country faced Lots of terroristic acts and disasters that reflected the importance of identification and reaching

the human being's identity to apply the hand of justice and prevent similar acts (**Bush and Bush 2011**).

The term disaster or mass disaster was defined as any catastrophe that occurred with or without previous warning and caused a threat to a wide range of a community in the form of injury or damage to properties or even death of large group of people with disruption of the surrounding environment to the extent that the whole effects were of such a great scale that couldn't be handled by different means of emergency and local authorized parties or government as a part of their daily practice, and therefore required extra mobilization of a higher organizations (**Sharma et al. 2006**).

Mass disasters could be natural as a result of water floods or earthquakes, accidental as road and railway accidents or unexpected fires, or manmade such as terroristic acts in Sinai and touristic ancient places like temples and museums as well as bombings. (**W.D.S Mc Lay, 2011**).

According to one of the newest report made by the Tahrir Institute's "Security Watch," Egypt had been facing an enormous wave of terroristic attacks since June 2013. It started with a wave of spike attacks in the northern Sinai, in July 2013, with a rate of approximately 30 attacks per month (**Salah 2016**) ( **Fig.1**).



**(Fig.1):** Chart showing the percentage of attacks reported in Sinai (TIMEP 2016)

Forensic determination became of great importance as radiographic pictures of skull base, long bones and teeth were the most anatomical parts used for these purpose due to their unique nature (**Bush and Bush 2011**). Such uniqueness in skull and face radiography was due to the presence of different anatomical curvatures and contours that allow later on superimposition and reaching the human’s identity (**Jawaid et al. 2014**).

The use of dentition in this field named forensic odontology and it was known as a branch of dentistry which handles, and examines dental evidence for subsequent proper evaluation of data to reach certain dental findings (**Sharma et al. 2006**). The forensic odontology was very important in mass disasters where trauma hinders the process of visual identification. Dental identification was of prime significance

because teeth were considered the most resistant body part that could survive total decomposition and even severely high temperatures and flames. **(Payne-James et al. 2011) (Sharma et al. 2006).**

With the appearance of Cone beam computerized tomography (CBCT) as an advanced radiographic imaging modality that showed superior details to diagnose cranial traumas, the number of radiographic scans requested by medical forensic professional personals had increased dramatically making it doable to apply such technique to aid in human identification by comparing images of important anatomical structures of skull. **(Marques et al. 2014) (Jawaid et al. 2014).**

Radiographic imaging was one of the main tools used for diagnostic purposes for dentists. The evolution of panoramic radiography in 1960 and its spread through the dental practice worldwide throughout the 1970s and 1980s had witnessed an enormous progress in the field of dental radiology, providing dentists with a comprehensive image of teeth, jaws as well as surrounding maxillofacial structures **(Miracle and Mukherji 2012).**

Nonetheless to say, different types of intraoral and extra oral radiographs used alone or in a combination with each other, suffer from the same inherent drawbacks of all two-dimensional (2D) projections