

**Original article:**

## **Incidence of metopism in Mumbai region of Maharashtra**

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### **Abstract:**

Two halves of the frontal bone meets in the midline to form metopic suture. Normally it starts to close in the second year of life and within a short duration, gets completely obliterated. The time of the closure of metopic suture varies from two to eight years and it can persist until adult age. Failure of the closure of two halves of the frontal bone even after the childhood is known as metopism. The present study was undertaken to observe the incidence of Metopism in the human skulls of Mumbai region of Maharashtra. This study was carried out on 100 cases referred to mortuary for post-mortem to Fmt dept, Grant Government Medical college of Mumbai. Metopism was found in 4% of the studied skulls.

**Key words:** Metopic suture, Metopism, Frontal bone, Skull.

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### **Introduction:**

Calvarium is formed by frontal, parietal, temporal, occipital, sphenoid and ethmoid bones.<sup>1</sup> There are different cranial sutures like coronal, sagittal, lambdoid, parietotemporal, metopic etc. Closure of each suture occurs at different age groups. For age estimation from skull sagittal, coronal & lambdoid sutures are commonly used. Suture closure begins internally and proceeds externally<sup>2</sup>. The metopic suture is a suture present between the two halves of the frontal bone which ossifies from two primary centres. It appears by the end of second month of foetal life and fuse first at the inner surface of the skull<sup>3</sup>. The fusion of the metopic suture commences at the anterior fontanelle proceeds downwards and terminates at the nasion<sup>4</sup>. Metopic suture disappears during infancy or in early childhood. Study by Piersol et.al. Concludes that the metopic suture disappears by the end of the fourth year, but according to Keith

et.al metopic suture disappears after the completion of first year of life<sup>5,6</sup>. According to Romanes, the metopic suture is present at birth but is normally closed by the fifth or sixth year, only traces of it being left above and below.<sup>7</sup> Hamilton states that the metopic suture disappears by the seventh year.<sup>8</sup> Warwick and Williams states that the two halves of the frontal bone begin to unite in the second year and the suture is usually obliterated by the eighth year.<sup>9</sup> There are various causes of the metopism like hydrocephalus, abnormal growth of cranial bones, growth retardation, sexual influence, heredity, atavism, plagiocephaly, scaphocephaly, mechanical causes and hormonal dysfunction.<sup>10</sup> Metopism displays varying degrees of incidence. It was 1% in Africans, 4-5% in Mongolian population and 7-8% in Europeans.<sup>11</sup> The frequency may range from 1% to 12% and the incidence is slightly higher in the male population.<sup>12</sup> Bryce reports metopism is present in

9.5 % of Scottish skulls, 8.7 % of European crania, 5.1 % of Mongolian subjects, 1.2 % of Negroes and 1% of Australian skulls.<sup>13</sup> It is important for paleodemography and forensic medicine.<sup>14</sup> It is essential to know about metopic suture failing which it can be easily misunderstood as fracture of frontal bone or even for the sagittal suture in radiological images<sup>10,15</sup>. Indian studies reports that the metopic sutures are varying in different regions of the country ranging from 2.66 to 5%.<sup>16,17& 18</sup>. This study attempts to identify the incidence of metopic suture in human skulls of Mumbai region of Maharashtra.

**Material and Methods:**

This study was carried out on 100 cases referred to mortuary for post-mortem of Forensic medicine department, Grant government medical college, Mumbai. The skulls with signs of diseases, visible abnormalities and damaged skulls were excluded from the study. After reflecting the scalp, skulls were macroscopically inspected for the presence of the metopic suture ectocranially. The calvaria were cleaned of soft tissues on both sides which made the sutures more prominent. For endocranial aspect, calvaria were opened by craniotome. The obliteration of the sutures was ascertained endocranially as well as ectocranially. These skulls were divided into three groups as normal skulls without any metopic suture, complete metopic suture and with incomplete metopic suture. A suture which is found completely between the bregma and nasion is termed as the complete metopic suture or metopism. If it extends to a smaller distance either from the bregma or from the nasion, it is termed as incomplete type. The data obtained were tabulated and analyzed through descriptive statistics. The incidence of metopism was noted in percentages and compared with other studies.

**Results:**

Totally 100 skulls were included. Ninety-six (96%) of the skulls had neither complete nor incomplete metopic suture. Four skulls (4%) had metopic suture in the form of complete suture. Thus metopism was observed in 4% cases.

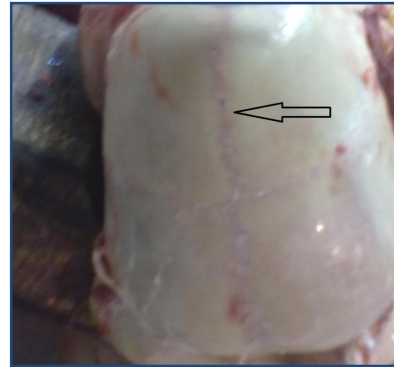


Fig.1. Complete metopic suture (Metopism)

Table 1: Incidence of the metopic suture in the present study.	
Extent of suture Percentage (%)	Number
Complete metopic suture (Metopism)	4
Incomplete	0

**DISCUSSION:**

Cranial sutures are classified as fibrous joints, meaning that they lack a synovial cavity and the bones are held together firmly by fibrous connective tissue.<sup>1</sup> The role of cranial suture is primarily to allow growth of a developing brain during intrauterine and extra uterine life. It also facilitate passage of foetus during vaginal delivery by allowing non-traumatic compression of the skull bones.<sup>19</sup> Metopic suture is a type of dentate suture extending from the nasion to

the bregma. Its timing of closure is still controversial. Persistent metopic suture may be misdiagnosed as a vertical traumatic skull fracture extending in the mid-line in head trauma patients.<sup>20</sup> Therefore the surgeon should be aware of this anatomical condition in the primary and secondary surveillance of the traumatized patient and during surgical intervention including especially frontal craniotomy.<sup>20</sup> A premature closure of the metopic suture is called as Trigonoccephaly.<sup>21</sup> The incidence of metopic synostosis is 5 to 15% .<sup>22</sup> According to Woo, metopism is more frequent among Whites and Mongoloids (about 10%) than among Negroids (2%).<sup>23</sup> Moreover, according to Baaten et al, people who live in rural areas have a higher incidence of metopism compared to people living in urban areas, with ratios of 4:1 and 4:2 respectively.<sup>24</sup> Ajmani et al carried out a study on 206 adult Nigerian skulls for the incidence of the metopic suture. They noted that metopism was present in 3.4% of cases, but an incomplete metopic suture was observed in 34.97% of the skulls. <sup>15</sup> Incidence of Metopism in Indian skulls was reported as 5% by Gupta R et al <sup>25</sup>, 5% by Shanta Chandrasekaran <sup>26</sup>, 1.2% by Murlimanju BV et al <sup>27</sup>, 2.66% by Agarwal et al. <sup>18</sup>, 3.31% by Das et al <sup>17</sup>, 2.53% in U.P. skulls Dixit and shukla <sup>28</sup>, 5.00% by Jit & Shah et al <sup>16</sup>, 2% by Fakhruddin and Bhalerao <sup>29</sup>. Ulhas shetty carried out study on 100

cases brought to mortuary of Maulana Azad medical college, Delhi for postmortem in order to determine age from skull in 2009. He observed metopism in 3% cases.<sup>30</sup>



Fig.2- Metopism

In the present study, Incidence of Metopism was observed in 4 cases (4%) which are higher than the previous Indian studies conducted by Murlimanju BV et al, Agarwal et al., Das et al , Dixit and shukla, Fakhruddin and Bhalerao, Ulhas shetty and Lesser than Gupta R et al, Shanta Chandrasekaran. It is also higher than the incidence reported in Australian, Nigerians, Negroids, Nepalese and Africans. <sup>13,15,23,31,32</sup>. But the incidence of metopism is lesser than Europeans <sup>7, 13, 32</sup>, Scottish ,Brazilian, <sup>13,33</sup> and Mangoloids <sup>23</sup>, (Table 2).

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Table 2: Incidence of metopism as reported by various Research Workers.

Research Workers	Race	Percentage
Bryce. et al., (1915) [13]	European	8.70%
Bryce. et al., (1915) [13]	Scottish	9.50%
Bryce. et al., (1915) [13]	Mongolian	5.10%
Bryce. et al., (1915) [13]	Negro	20.0%
Bryce. et al., (1915) [13]	Australian	1.00%
Jit & Shah. et al., (1948) [16]	Indian (Punjabi)	5.00%
Keith. et al., (1948) [6]	Subject to race	3.0%
Woo. et al., (1949) [23]	Mongoloids	10.0%
Woo. et al., (1949) [23]	Negroids	2.0%
Breathnach. et al., (1958) [32]	European	7-10%
Breathnach. et al., (1958) [32]	Yellow races	4-5%
Breathnach. et al., (1958) [32]	Africans	1.00%
Romanes. et al., (1972) [7]	Europeans	Up to 8.00%
Das. et al. (1973) [17]	Indian(UP)	3.31%
Agarwal. et al., (1979) [18]	Indian (Kanpur)	2.66%
M. L. Ajmani. et al., (1983) [15]	Nigerians	3.40%
Bilodi et al. (2003) [31]	Nepalese	3.92%
Castilho et al. (2006) [33]	Brazilian	7.04%
Murlimanju BV. et al (2010) [27]	Indian	1.2%
Shanta Chandrasekaran (2011) [26]	India(South India)	5.0%
Gupta R. et al. ,(2012) [25]	Indian(U.P)	5.0%
Present study	Mumbai region	4%

### Conclusion:

This study has shown that the incidence of metopism in Mumbai region of Maharashtra is 4%. The information about metopic sutures is enlightening for the medicolegal consultants and forensic experts. On post-mortem presence of metopic suture may mislead in age estimation in unknown bodies. In cases referred for age estimation, radiologically it may mislead in age estimation. Their morphological

details are important for the clinician from radiological and surgical point of view. In order to prevent confusion and a wrong diagnosis in emergency situations while reading the X-ray/ CT and MRI films the possibility of the metopic suture should be kept in mind .We believe that the present study has provided some important valuable data which will contribute to the scientific literature.

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