

## Frequency of intracranial complications among patients of chronic suppurative otitis media presenting at tertiary care hospital, Karachi

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### Abstract:

**Objective:** To determine the frequency of intracranial complications among the patients of chronic suppurative otitis media presenting at tertiary care hospital, Karachi.

**Study design:** Descriptive cross-sectional study.

**Place and duration:** Department of Ear, Nose, Throat and Head and Neck Surgery, Jinnah Post-Graduate Medical Centre, Karachi from July 2013 till January 2014.

**Material and methods:** A total of 177 patient of either sex (aged 18 to 50 years) who gave informed consent, having ear discharge for 6-12 weeks, perforated tympanic membrane confirmed by otoscopic examination were included. The approval was taken from the research and ethical committee of JPMC, Karachi. Data was collected on predesigned proforma, CT scan temporal bone was done to confirm the diagnosis. SPSS version 20 was used for statistical analysis. Descriptive analysis was done for all demo-graphic variables. The frequency of intracranial complications in chronic suppurative otitis media was determined and Chi square test. P-value <0.05 was considered significant.

**Results:** The mean age of the patients were  $30.1 \pm 9.3$  years and mean duration of disease were  $9.4 \pm 2.89$  weeks. Male patients were (54.8%) whereas (45.2%) were female. Frequency of intra-cranial complications shows that meningitis was found in (21.5%), lateral sinus thrombosis in (4.5%) and Otitic hydro-cephalus was found in (2.8%) patients. Statistically significant ( $P < 0.05$ ) difference was found between presence of meningitis with gender and duration of disease.

**Conclusion:** Common intra-cranial complications among the patients of chronic suppurative otitis media were meningitis, lateral sinus thrombosis and otitic hydro-cephalus based on the study carried out at Jinnah Post-Graduate Medical Centre, Karachi.

**Keywords:** Intra-cranial complications, chronic suppurative otitis media, hydro-cephalus, meningitis, lateral sinus thrombosis.

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### Introduction:

Chronic Suppurative Otitis Media (CSOM) is a perforated tympanic membrane with persistent drainage from middle ear. CSOM is defined as chronic otorrhea, lasting for more than 6-12 weeks through a perforated tympanic membrane.<sup>1,2</sup> Chronic otitis media is very serious disease because it can lead to both intra cranial and extra cranial complications. It is commonly a disease of the developing world with malnutrition, over-crowding, substandard hygiene, frequent upper respiratory tract infections and

under-resourced health care all are linked to low socio-economic status listed as risk factors.<sup>3</sup> Individuals tend to live with the disease, tolerate its discomfort with resultant fatal consequences not only because of insufficient work force and health care facilities but also due to inaccessibility to health care.<sup>4,5</sup> When established, it is very difficult to treat. Medical management needs to be continued for many weeks and even when the perforation is dry, patient are at risk of further episodes of discharge until the tympanic membrane has healed.<sup>6</sup>

Chronic Suppurative Otitis Media initiated by an episode of acute infection. It begins with irritation and subsequent inflammation of middle ear mucosa. The inflammatory response creates mucosal edema which eventually leads to mucosal ulceration and consequent breakdown of the epithelial lining. Infection spread by different routes to cranial cavity, from direct erosion of bone, hemato-genous dis-semination, through anatomical pathways and previous trauma. From middle ear infection spread to involve the mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis and intra-cranial abscesses. Cholesteatoma are the end stage of (squamous epithelial) retractions of pars tensa or flaccida that are not self-cleansing, retain epithelial debris and elicit a secondary, inflammatory mucosal reaction.<sup>7</sup> The cycle of inflammation, ulceration, infection, and granular tissue formation may continue, destroying the surrounding bony margins and ultimately leading to various complications of CSOM.<sup>6,7</sup>

Chronic Suppurative Otitis Media is one of the most common ear diseases in South East Asia having a prevalence of approximately 5.2% in the general population.<sup>8</sup> The most common intracranial complications of CSOM are meningitis, lateral sinus thrombosis and otic hydrocephalus with reported frequencies of 21-72%, 2-26% and 5-11% of all intra-cranial complications, respectively.<sup>9,10</sup> Intra-cranial complications can be ascribed to delayed presentation, advanced disease and inadequate treatment of CSOM.<sup>10,11</sup> In developed nations worldwide otitis media has a very low prevalence of less than 1%, it is an endemic condition among developing nations.<sup>12</sup> A study in 2004 by Morris investigating the prevalence of otitis media in 709 Aboriginal children from Northern and Central Australian communities discovered that nearly all children examined had some form of otitis media.<sup>13</sup> The World Health Organization (WHO) has indicated that a prevalence rate of CSOM greater than 4% in a defined population is indicative of a massive public health problem.<sup>12</sup> Even if antibiotics are used early in intra-cranial complications arising

from otitis media, there is an alarmingly high mortality rate of 18.4%. If antibiotic treatment is not used (as may be the case in un-diagnosed cases of chronic suppurative otitis media), this mortality rate increases significantly to 76.4%.<sup>14</sup> Another study done in 2006 at Civil hospital, Karachi having the prevalence of intra-cranial complication of chronic suppurative otitis media is 2.3%, with meningitis 0.25% and brain abscess 0.5%.<sup>15</sup>

In developing countries the rate of complications from chronic suppurative otitis media is still high, due to poverty.<sup>16</sup> Reducing the rate of intra-cranial complications in these patients is worth while goal even as attempts are made to prevent CSOM. Chronic suppurative otitis media like any chronic disease, can limit an individual's employability and quality of life.

The study aimed to determine the frequency of intracranial complications among the patients of chronic suppurative otitis media presenting at tertiary care hospital, Karachi. As different studies show wide ranges<sup>9-10</sup> so the exact magnitude is still controversial, therefore this study is designed to assess the exact and current magnitude of these complications, there by policy could be devised to screen CSOM cases routinely and prompt treatment could prevent further complications.

#### **Methodology:**

A cross-sectional study was conducted from July 2013 till January 2014 at Department of Ear, Nose, Throat and Head and Neck Surgery, Jinnah Post-Graduate Medical Centre, Karachi. A sample size of 177 was computed, by taking margin of error as 4%, least proportion of intracranial complications of CSOM as 8%, with 95% confidence interval.

By using non-probability convenient sampling technique, patient of either sex (aged 18 to 50 years) who agreed to participate and gave informed consent, having ear discharge for 6-12 weeks, perforated tympanic membrane confirmed by oto-scope examination were included. Patients who had some serious systemic

Table-1: Descriptive Statistics

Variable	Frequency (n = 177)	Percentage (%)
Age (years)		
Mean ± SD (Range)		
30.1 ± 9.33 (18 – 44)		
≤ 25	111	62.70
>25	66	37.30
Gender		
Male	97	54.80
Female	80	45.20
Duration of disease (weeks)		
Mean ± SD		
9.47 ± 2.89 ≤ 8	72	40.70
>8	105	59.30
Meningitis		
Yes	38	21.50
No	139	78.5
Lateral sinus thrombosis		
Yes	8	4.50
No	169	95.50
Otitic hydrocephalus		
Yes	5	2.80
No	172	97.20

Table-2: Cross tabulation of age, gender and duration of disease with Meningitis, Lateral Sinus Thrombosis and Otitic hydrocephalus

Variable	Malignancy		Total (n-77)	P-value
	Yes	No		
<b>Age (years)</b>				
≤ 25	26(23.4)	85(76.6)	111	0.411
>25	12(18.2)	54(81.8)	66	
<b>Gender</b>				
Male	28 (28.9)	69 (71.1)	97	0.008
Female	10 (12.5)	70 (87.5)	80	
<b>Duration of disease (weeks)</b>				
≤ 8	28 (38.9)	44 (61.1)	72	0.001
> 8	10 (9.5)	95 (90.5)	105	
<b>Lateral Sinus Thrombosis</b>				
<b>Age (years)</b>				
≤ 25	3(2.7)	108(97.3)	111	0.131
>25	5(7.6)	61(92.4)	66	
<b>Gender</b>				
Male	4 (4.1)	93 (95.9)	97	0.780
Female	4 (5.0)	76 (95.0)	80	
<b>Duration of disease (weeks)</b>				
≤ 8	5 (6.9)	67 (93.1)	72	0.198
> 8	3 (2.9)	102 (97.1)	105	
<b>Otitic Hydrocephalus</b>				
<b>Age (years)</b>				
≤ 25	2 (1.8)	109 (98.2)	111	0.287
>25	3 (4.5)	63 (95.5)	66	
<b>Gender</b>				
Male	3 (3.1)	94 (96.9)	97	0.813
Female	2 (2.5)	78 (97.5)	80	
<b>Duration of disease (weeks)</b>				
≤ 8	3 (4.2)	69 (95.8)	72	0.372
> 8	2 (1.9)	103 (98.1)	105	

illness, like hypertension, diabetes mellitus, bleeding disorder, congestive heart failure, malignancy and those who were mentally retarded were excluded. The approval was taken from the research and ethical committee of JPMC, Karachi.

The data was collected by researcher herself on the predesigned proforma, which includes patient demography, history of ear-ache, ear-discharge with duration, head-ache, fever, neck stiffness, nausea, vomiting, vertigo and level of consciousness with detailed ear nose and throat examination. CT scan temporal bone was also done to confirm the diagnosis. The outcome variables like meningitis, lateral sinus thrombosis and otitic hydro-cephalus was labeled as positive on the basis of operational definition.

SPSS version 20 was used for statistical analysis. Descriptive analysis was done for all demographic variables. The frequency of intra-cranial complications in chronic suppurative otitis media was determined and chi square test was used to observe the association of the age, sex and duration of disease with intra-cranial complications of CSOM. P-value <0.05 was considered significant.

### Results:

A total of 177 patients were selected and examined. The mean age of the patients was 30.12 years with the standard deviation of 9.3 years. There were 111(62.7%)patients less than or equal to 25 years and 66 (37.3) were more than 25 years. Frequency of male patients was 97(54.80%) whereas 80(45.20%) patients were female. Mean duration of disease was 9.47 weeks with the standard deviation of 2.89 weeks. Duration of disease was less than or equal to 8 weeks in 72 (40.70%) patients while 105 (49.30%) patients having duration of disease more than 8 weeks. (table 1)

Frequency of intra-cranial complications shows that meningitis was found in 38(21.5%) patients, lateral sinus thrombosis in 8(4.5%) patients and otitic hydro-cephalus was found in 5(2.8%) patients. (table 1)

Cross tabulation was done to see the relationship between age, gender and duration of disease to the presence of intra-cranial complications i.e. meningitis, lateral sinus thrombosis and otitic hydrocephalus. The meningitis was mostly present in 26 (23.4%) patients of age  $\leq 25$  years, 28 (28.9%) males and 28 (38.9%) patients having duration of disease  $\leq 8$  weeks.

The lateral sinus thrombosis was more common complication present in 5 (7.6%) patients of age  $> 25$  years, females 4 (5%) and duration of disease  $\leq 8$  weeks 5 (6.9%).

The otitic hydro-cephalus was also mostly present in 3 (4.5%) patients of age  $> 25$  years, 3 (3.1%) males and 3 (4.2%) of patients having duration of disease  $\leq 8$  weeks.

Chi-square test was applied and statistically significant relationship was observed for meningitis with gender (p-value 0.008), meningitis with duration of disease (p-value 0.001). (table 2)

#### Discussion:

Chronic suppurative otitis media initiated by an episode of acute infection. It begins with irritation and subsequent inflammation of middle ear mucosa. The inflammatory response creates mucosal edema which eventually leads to mucosal ulceration and consequent break-down of the epithelial lining. Infection spread by different routes to cranial cavity, from direct erosion of bone, hematogenous dissemination, through anatomical pathways and previous trauma. From middle ear infection spread to involve the mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis and intracranial abscesses. Cholesteatoma are the end stage of (squamous epithelial) retractions of pars tensa or flaccida that are not self-cleansing, retain epithelial debris and elicit a secondary, inflammatory mucosal reaction.<sup>7</sup>

The cycle of inflammation, ulceration, infection, and granular tissue formation may continue, destroying the surrounding bony margins and

ultimately leading to various complications of CSOM.<sup>6,7</sup>

CSOM is one of the most common ear diseases in South East Asia having a prevalence of approximately 5.2% in the general population.<sup>8</sup> The most common intra-cranial complications of CSOM are meningitis, lateral sinus thrombosis and otic hydro-cephalus with reported frequencies of 21-72%, 2-26% and 5-11% of all intra-cranial complications, respectively.<sup>9,10</sup>

Intra-cranial complications can be ascribed to delayed presentation, advanced disease and inadequate treatment of CSOM.<sup>10,11</sup>

In developed nations worldwide otitis media has a very low prevalence of less than 1%, it is an endemic condition among developing nations.<sup>12</sup> A study in 2004 by Morris investigating the prevalence of otitis media in 709 aboriginal children from Northern and Central Australian communities discovered that nearly all children examined had some form of otitis media.<sup>13</sup>

In this study, frequency of intra-cranial complications shows that meningitis was found in 38 (21.50%) patients, lateral sinus thrombosis was found in 8 (4.50%) patients and otitic hydrocephalus was found in 5 (2.80%) patients.

The World Health Organization (WHO) has indicated that a prevalence rate of CSOM greater than 4% in a defined population is indicative of a massive public health problem.<sup>12</sup>

Even if antibiotics are used early in intra-cranial complications arising from otitis media, there is an alarmingly high mortality rate of 18.4%. If antibiotic treatment is not used (as may be the case in un-diagnosed cases of CSOM, this mortality rate increases significantly to 76.4%.<sup>14</sup>

Another study done in 2006 at Civil Hospital, Karachi having the prevalence of intra-cranial complication of chronic suppurative otitis media is 2.3%, with meningitis 0.25% and brain abscess 0.5%.<sup>15</sup>

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tions from chronic suppurative otitis media is still high, due to poverty.<sup>16</sup> Reducing the rate of intra-cranial complications in these patients is worth while goal even as attempts are made to prevent CSOM. Chronic suppurative otitis media like any chronic disease, can limit an individual's employability and quality of life.

CSOM most often occurs in the first 5 years of life,<sup>17</sup> and it is most common in developing countries, in special populations such as children with craniofacial anomalies, and in certain racial groups.<sup>18</sup>

Highest prevalence of CSOM in children are reported among the Inuits of Alaska, Canada and Greenland, American Indians, and Australian Aborigines, and range from 7% to 46%.<sup>19</sup>

Intermediate prevalence are reported in the South Pacific Islands, Africa, Korea, India, and Saudi Arabia, ranging from 1% to 6%.<sup>20,21</sup> The lowest prevalence are found in highly developed industrial countries such as the UK and the US: <1%.<sup>22</sup>

Fliss et al<sup>23</sup> have identified a history of acute and recurrent otitis media, parental history of chronic otitis media, and crowded conditions (i.e. large families with several siblings, large day care centers) as significant risk factors for CSOM. They could not establish an association between CSOM and allergy, recurrent upper respiratory infections, breast feeding, sex, parental age, or passive smoking. From a clinical perspective, however, some of these risk factors for AOM are likely to play a role in CSOM.<sup>24,25</sup>

No quantitative data on risk factors for CSOM, such as odds ratios or prognostic models that can predict which children will develop CSOM, are available. The Eustachian tube has three important functions with respect to the middle ear: ventilation, protection, and clearance. Both endogenous and exogenous factors can impair these functions and therefore cause OM (otitis media).<sup>26</sup>

When a perforation of the tympanic membrane is present, either spontaneously or due to a tym-

panostomy tube, the middle ear "gas cushion" is lost, resulting in reflux of nasopharyngeal secretions through the Eustachian tube and consequent contamination of the middle ear with potential respiratory pathogens. Infants and young children are especially at risk for such reflux because their Eustachian tubes are short, horizontal, and "floppy".<sup>27</sup>

Similarly, Down syndrome and craniofacial anomalies such as cleft palate affect both the anatomy and function of the Eustachian tube and so predispose to CSOM.

Yuceturk et al<sup>26</sup> studied Eustachian tube function (automatic Toynbee test, tympanometry, Valsalva's manouvre) in 60 ears with CSOM and 146 control ears, finding Eustachian tube dysfunction in 72% (95% CI, 61—83) versus 35% (95% CI, 27—43), respectively, ( $p < 0.05$ ). Reduced ciliary function of the middle ear and Eustachian tube mucosa has been associated with impairment of clearance of middle-ear secretions and may, therefore, facilitate the progression from AOM/OME into CSOM.<sup>28</sup>

#### **Conclusion:**

Common intracranial complications among the patients of chronic suppurative otitis media were meningitis, lateral sinus thrombosis and otitic hydrocephalus presented at Jinnah Post-Graduate Medical Centre, Karachi.

**Conflict of interest:** None

**Funding source:** None

#### **Role and contribution of authors:**

Dr Naveen Shahid, study designing, writing of manuscript and editing

Dr Naveed Mansoori, manuscript editing and critical revision and final approval.

Dr Imran Bakar, interpretation of data, editing and proof reading.

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