

# Comparison of TMD pain between Adolescents in India and Sweden

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## **Abstract**

**Aims:** (i) To evaluate the prevalence of tension-type headache, and TMD pain among adolescents in India. (ii) To compare school absence, analgesic consumption, jaw function and perceived treatment need among adolescents with TMD pain, with a group of adolescents with TMD pain in Sweden.

**Methods:** Three cohorts were investigated, one in India and two in Sweden. In India a total of 951 adolescents aged 12 to 17 years participated. The subjects were students in private schools. The investigation consisted of a questionnaire including questions on prevalence, pain intensity, consequences of pain, and health seeking behaviors for TMD pain and headache.

In Östergötland County, Sweden, TMD pain was recorded for all consecutive Public Dental Service (PDS) patients aged 12-19 years, a total of 28 899.

In a population-based sample, 587 consecutive patients aged 12–19 years answered a postal questionnaire. The questions were about TMD pain and were the same as the questions used in the Indian sample.

**Results:** The main findings were that the prevalence of TMD pain among adolescents in India was 15.6%, slightly higher among girls than boys. More than half of the subjects suffered from headache.

Comparing the consequences of TMD pain in India and Sweden, the results revealed significantly higher rates of analgesic consumption and pain intensity in Sweden. Functional limitations were significantly more severe in India.

**Conclusion:** The prevalence of TMD pain was markedly higher in India than in Sweden. In both countries TMD pain was reported to affect the individual's activities in daily life.

## **Background**

Recurrent pain in children and adolescents is most commonly located in the head, stomach or musculoskeletal system (1-3). Epidemiological data vary considerable due to methodological differences which give rise to some variance in prevalence. Perquin et al. (2) investigated the prevalence of pain in a community sample of Dutch children and adolescents and found that 25% reported chronic pain. Girls reported chronic pain and pain at multiple sites significantly more than boys, particularly in the older age groups. The most common pain complaints were limb pain, headache, and abdominal pain.

Tension-type headache (TTH) and migraine has been found in adolescents, with a reported prevalence of 12%–49% and 3-17 % respectively, using IHS criteria (4-6). Laurell et al. (5) found the prevalence of headache to increase with age at a similar rate in girls and boys up to 11 years, and thereafter only in girls. Several studies have reported an overlap between TTH and Temporomandibular Disorders (TMD) (7-9).

TMD pain is by far the most common of the chronic orofacial pain conditions. A systematic review found that self-reported TMD pain among children and adolescents varied between 0.7% and 18.6%. (10) Two large epidemiological studies from Sweden, found TMD pain prevalence ranging from 4.2%- 7% in adolescents in the age 12-19 years (8,11). These studies reported a female predominance and an increase in TMD pain with age.

Among adolescents, Nilsson et al. (12) found that 26% of the TMD subjects consumed analgesics each week and 25% were absent from school at least 1 day per month because of TMD pain. Sixty-six percent has a perceived need for TMD treatment. TMD pain has been reported to be similar to back pain and headache in its intensity, persistence, and psychological impact (13).

There are studies indicating that prevalence of pain in adolescents e.g. headache varies between countries (14). In India the prevalence of recurrent headache was found to be 18% in boys and 21% in girls (15). There are no studies reporting prevalence of TMD in India. Ethnic and cultural factors have been suggested to influence pain classification, perception of pain severity, and health-seeking behavior (16).

The main hypotheses were that the prevalence of TMD pain and headache among adolescents in India is lower than among Swedish youths, that analgesic consumption for this kind of pain is higher in Sweden, and that school absence due to TMD pain or headache was higher in Sweden.

The aims of the study were to (i) evaluate the prevalence of TMD pain among boys and girls in India. (ii) To compare school absence, analgesic consumption, jaw function and perceived treatment need among adolescents with TMD pain, with a group of (age- and gender-matched) adolescents with TMD pain in Sweden. (iii) To evaluate the prevalence of headache among adolescents in India.

## ***Methods***

### ***Subjects***

Three cohorts were investigated, one in India and two in Sweden.

In India a total of 951 adolescents, 517 girls and 434 boys, participated. The subjects were between 12 and 17 years old and were students in three private schools in Belgaum, India.

In Sweden the studies were conducted in the County of Östergötland. The subjects were adolescents aged 12-19 years. In the first study in the year 2000, a total of 28,899 youths participated (72.8% of the population), 13,843 girls and 15,056 boys. In the second study a sample of 587 adolescents, 454 girls and 133 boys, from the same population participated.

The subjects were drawn from adolescents attending the Public Dental Service (PDS) clinics from October 2002 to February 2004.

### ***Design India***

Adolescents in the ages 12–17 years at Herwadkar English School, St Joseph's Canossian Convent School and St Paul's High School in Belgaum participated in the investigation. The epidemiological investigation took place during the summer 2009. The teachers and students were informed about the study. The investigation consisted of a self-reported questionnaire including questions on prevalence, pain intensity, consequences of pain, and health seeking behaviors for TMD and tension-type headache. All subjects answered the questionnaire during class session. Two researchers and a local dentist were available to explain the questions if necessary.

Subjects were not financially compensated for their participation, but all participants received a toothbrush from the Swedish company TePe®.

Participants with TMD pain and a perceived need for treatment were offered a clinical examination and rescue treatment free of charge, e.g. an occlusal appliance (Relax<sup>TM</sup> from Unident<sup>®</sup>) and instructions in jaw exercises. Assessment and evaluation of the treatment was not a part of the study.

The study was approved by the local medical authorities.

### ***Design Sweden***

The epidemiological variable TMD pain was introduced to all PDS personnel in Östergötland County, Sweden, via internal television, and written information was sent to all clinics. The variable TMD-S was then recorded for all consecutive PDS patients aged 12-19 years who were examined during 2000.

In a population-based sample, a postal questionnaire was sent to 350 consecutive patients with self-reported TMD pain and 350 healthy age- and sex-matched individuals, 2–4 weeks after their annual examination at the PDS clinic. The 33 clinics reported consecutive patients who visited the clinics during the study period and for whom a positive TMD pain had been recorded by mail to the investigator, who then mailed the questionnaires to the patients. The controls were consecutive age- and sex-matched individuals from the same PDS clinics. After 1 month, a reminder letter was mailed to those who had not replied. A telephone call was later made to those who failed to reply to the reminder.

Questions about TMD pain, pain intensity, analgesic consumption, school absence, perceived treatment need for TMD pain, and jaw function limitation were the same as those used in the Indian sample.

Written consent from parents was obtained, and participants received a remuneration of SEK 50 after returning the questionnaire. The study was approved by the ethics committee at the Faculty of Health Sciences at Linköping University.

## *Assessment instruments - questionnaires*

### *TMD pain*

The adolescents were asked two questions to ascertain whether they had ambient or functional jaw pain: (i) Do you have pain in the temple, face, jaw joint, or jaws once a week or more often? and (ii) Do you have pain when you open your mouth wide or chew once a week or more often? To facilitate comprehension, the questionnaire included an illustration of the anatomic regions mentioned so that the respondents would better understand the question. Those subjects that/who answered yes in one or both of the questions were registered as TMD-subjects. (11)

*Toothache.* Determined by asking: In the last month, have you had a toothache more than once when biting or chewing? and If yes, did the toothache get worse when you ate or drank something cold or warm? The subjects who answered yes to both of the questions, were considered having pulpitis.

*Age and gender.* Determined by asking: How old are you? and Are you a boy or a girl?

*Pain intensity.* Recorded on an 11-point numerical rating scale (NRS) ranging from 0 to 10 and anchored with the terms “no pain” and “worst pain imaginable” (17,18)

*Analgesic consumption.* Recorded on a 5-point rating scale that measured frequency of pain medication use: daily, 3–4 times a week, 1–2 times a week, every month, never or almost never.

*School absence.* Determined by asking the patient how many days in the last month she or he was at home from school because of TMD-pain or headache, respectively.

*Treatment need.* Determined by asking one question: “Would you like to get help with your pain in the face, the jaws or the jaw joints”.



*Frequency of headache.* Scored on a 5-point scale: never, 1–11 times per year, 1–3 times a month, 1–3 times a week, every second day or more often (19).

*Treatment from other caregivers for pain.* Determined by asking the patient “Have you gone to a doctor, school nurse, dentist, physical therapist, or other health-care provider for your pain? The questions were dichotomous: yes or no.

*Jaw function limitation.* Determined by asking the patient to fill out the Jaw Function Limitation Scale (JFLS). The JFLS contains 14 items on jaw function, which the patient grades on a 4-point NRS ranging from 0 to 3, with 0 anchored as “No limitation” and 3 anchored as “Severe limitation”. (20)

### ***Classification***

Frequency of headache was determined by using the IHS criteria. The patients were assigned the classifications infrequent episodic headache (<12 days/year), frequent episodic headache ( $\geq 12$  days/year < 15 days/ month), chronic headache ( $\geq 15$  days/month) or no headache (19).

### ***Statistical analysis***

The chi-square test was used to compare categorical variables such as gender. The t-test was used for comparison of continuous variables. The level of significance was set at  $P < 0.05$ .

Data were analyzed with the statistical program SPSS, version 12.0.

## **Results**

There were no drop-outs in India, but there were missing answers in some of the questions. In the first Swedish study there were no drop-outs, but in the second study 587 out of 700 answered the postal questionnaire.

### ***Prevalence of TMD pain***

The overall prevalence of TMD pain was 15.6%. The prevalence was slightly higher among girls than boys (Table 1). The prevalence decreased markedly when subjects with concurrent toothache were excluded, as shown in table 2.

### ***Prevalence of headache***

The results of the study reveal that the prevalence of self-reported headache among Indian adolescents was 63.0 %. The majority of those suffering from headache were girls (Table 3).

The frequency of headache differs as shown in table 4. Among those suffering from headache, the most common frequency was every week, while the least common frequency was every second day or more often. When strictly following the IHS criteria, the prevalence of tension-type headache was < 2.0%.

### ***TMD pain in India compared to Sweden***

The prevalence of TMD pain was 15.6 % in India and 3.9% in Sweden among 12-17 year olds.

Table 5 shows the consequences of TMD pain in India and Sweden. The results revealed a significantly higher rate of analgesic consumption in Sweden due to TMD pain. The self-reported pain intensity is also significantly higher in Sweden. Perceived need for treatment of TMD pain is similar in the two countries. Considering school absence due to TMD pain the results show no significant differences.

Table 6 shows that the prevalence of TMD pain increased with age among Indian and Swedish girls. In both countries, the prevalence rose markedly for girls in the ages 15-16 years old. Considering the boys in India, the data were very uneven.

Figure 1 shows data from the JFLS. There were significant differences ranging from  $p < 0.000$  to  $p < 0.023$  between the two countries considering mastication, communication and total score. In all categories India has the higher value.

## ***Discussion***

The main findings were that the prevalence of TMD pain among adolescents in India was 15.6 % and considerable higher than in a Swedish adolescent population. More than half of the Indian subjects suffered from headache, but chronic headache was rare. In both countries TMD pain influenced daily life, but in Sweden the pain intensity and the use of analgesics were significantly higher. As with TMD pain it was more common with headache among girls. A majority of individuals with TMD-pain had a perceived need for treatment.

The number of subjects enrolled in the Swedish prevalence study differed markedly compared with the number of participants in the Indian study. The subjects in the Swedish study have previously been reported to be representative for adolescents living in Sweden. The Indian population differed both regarding age and gender distribution compared with adolescent population living in that area of India. A possible explanation is that the schools which were sampled from different areas of the town did not fully represent the adolescent population living in the community.

The distribution of participants varied in the different age groups which may have influenced the results. The respondents all came from private schools, which may not represent all Indian adolescents. The subjects in the Swedish study were in the ages 12-19 years, but in the Indian study the adolescents were a bit younger. This is something to consider when comparing the results.

Considering the design of the studies, there are some differences, not only the number of subjects but also the method. Identical questions were used to determine the prevalence of TMD pain, but there were differences in how the questions were administered. In India a questionnaire was used whereas in Sweden the questions were asked verbally at the PDS clinic. To minimize this problem, when using only the questionnaire in India, the researchers

were present when the questionnaires were answered. Analyzing consequences of pain identical questions were used both in the Swedish and Indian population. Using the same questions in both countries made it possible to do a valid comparison. This is one of the strengths of the study.

Another strength with the design is that the questions used for TMD pain, have strong reliability. Nilsson et al. (9) showed that asking the two questions “do you have pain in the temple, face, jaw joint, or jaws once a week or more often” and “do you have pain when you open your mouth wide or chew once a week or more often”, was a good method to identify patients with TMD pain.

One limitation with the design of the Indian study was that the questionnaires were handed out and filled in during class. This lead to some stress among the adolescents which may have had an impact on the reliability of the results. Another aspect is that the questionnaire was in English, although that is not the native language for the Indians. However English is one of the most important languages for national, political, and commercial communication (21). Considering the young age of the respondents, some of the items in the questionnaire may have been too complicated for them to understand.

The high prevalence of headache in India is similar to results found in a Swedish population (5). In the Indian study the prevalence was 63.0% and in the Swedish study 44.8%. These results include all types of headache which may explain the relatively high prevalence. In the previously mentioned Indian study from Shivpuri et al. (15) the prevalence of recurrent headache was 18% in boys and 21% in girls in the ages 11-15 years. A possible explanation to the higher prevalence in our study could be that the adolescents were the ones answering the questionnaire whereas in the other study the parents answered the questionnaire. It is possible that the children do not mention their headache to their parents and therefore the prevalence got lower than it should be. Another factor influencing the difference in prevalence between

the two Indian studies could be that Shrivastava et al. asked about recurrent headache, whereas in this study the questions were about headache in general.

When strictly following the IHS criteria the prevalence of different types of headache was extremely low. Therefore one might suspect that the IHS criteria are too complicated when doing a questionnaire survey. Anttila et al. (4) mentioned that the IHS criteria might be too restrictive to differentiate tension-type headache from migraine without aura in children.

TMD pain prevalence was 15.6% in India but only 4.2-7% in Sweden. The high prevalence in India could be due to difficulties in specifying the origin of pain. No intraoral examination was made in India to differentiate toothache from TMD pain. This could be a factor increasing the prevalence of TMD pain. When the subjects with presumed pulpitis were excluded from the group with TMD pain, the prevalence decreased to 5.3%. This result is more similar to that in the Swedish study. Hongxing L et al. (22) found a high prevalence of TMD pain in Chinese adolescents, i.e. 14.8%. The result is similar to that in India. The Chinese study also mentions the positive correlation between TMD pain and poor oral health. It is very important to include a clinical examination to decide whether the pain is of dental cause or not. This is something to consider when doing similar studies.

In accordance with Nilsson et al. (12), Hongxing L et al. (22) and List et al. (8) the Indian study showed that the prevalence of TMD pain is higher among girls than boys. In addition, an increase of TMD pain with age was found in both India, China and Sweden.

Considering the high prevalence of TMD pain that was found in the Indian study, it might be a valuable thing to use the two screening questions for TMD pain in the dental clinics in India.

Comparing the consequences of TMD pain in India and Sweden, the results revealed a significantly higher rate of analgesic consumption in Sweden. Also the values for self-

reported pain intensity were significantly higher in Sweden. The high rates of pain intensity in Sweden could be due to a conception of not getting proper health care if one does not exaggerate the perception of pain. Another aspect could be that Indians are more used to having pain. The higher consumption of analgesics in Sweden could be explained by cultural differences in reducing pain. Do the Indians rely more on herbal medications? The Indians might cope better with pain than Swedes.

Functional limitations due to TMD pain, i.e. limitations of mastication and communication, were significantly more severe in India compared to Sweden. This could be because the subjects with toothache were not excluded from these results. Maybe the rate of limitation would be more similar to that in Sweden if the subjects with toothache had been removed from these results. Several studies have reported that DMFT is similar among adolescents in India and Sweden (23-25). Comparing neighbouring countries to India and Sweden, respectively, data show that even though the DMFT is similar, the rate of treated caries is higher in the more developed country (26,27). These data leads to the assumption that caries in developed countries seldom gives pain because the decayed teeth are treated before symptoms arise. Therefore it is possible that several of the participants reporting TMD pain in this study may have had dental pain masking the pain in TMD pain. Further studies including clinical examination is important to rule out this problem.

Since the prevalence of TMD pain is quite high in India, it might be a good idea to use the two questions; (i) Do you have pain in the temple, face, jaw joint, or jaws once a week or more often? and (ii) Do you have pain when you open your mouth wide or chew once a week or more often? as a screening tool in dental clinics. This is an easy way to detect the adolescents with TMD pain. Simple reversible therapies such as information, relaxation training, jaw exercises, and occlusal appliances have been recommended for treatment of

TMD pain (28) and could easily be incorporated among management strategies by dentists in India.



## **Conclusions**

These conclusions can be drawn from the results presented in this study:

- In 2009, the prevalence of self-reported TMD pain among adolescents aged 12-17 in Belgaum was 15.6 % and was slightly higher among girls than boys.
- The prevalence of self-reported headache in the investigated group was 63.0%. The most common frequency of headache was every week. Only 2.5% had chronic headache.
- Comparing pain intensity and analgesic consumption due to TMD pain revealed significantly higher scores for Swedish adolescents compared to Indian.
- Jaw function limitations due to TMD pain were significantly more severe in India compared to Sweden.
- A majority of the participants in both countries with TMD pain had a perceived need for treatment.

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## Appendix

**Table 1.** Prevalence of TMD pain among adolescents in India. From a total of 951 subjects, 898 answered this question.

<b>TMD pain</b>	<b>%</b>	<b>n</b>
Boys	14.9	63
Girls	16.2	77
Total	15.6	140

**Table 2.** Excluding subjects with toothache (presumed pulpitis) from those with TMD pain, the prevalence decreases to 5.3%.

<b>TMD but not toothache</b>	<b>%</b>
No	94.7
Yes	5.3

**Table 3.** From a total of 951 subjects, 897 answered this question. The prevalence of self-reported headache was slightly higher among girls than boys.

<b>Headache</b>	<b>%</b>	<b>n</b>
Boys	58.0	242
Girls	67.3	323
Total	63.0	565

**Table 4.** Using the IHS criteria, the table shows the most common frequency of headache.

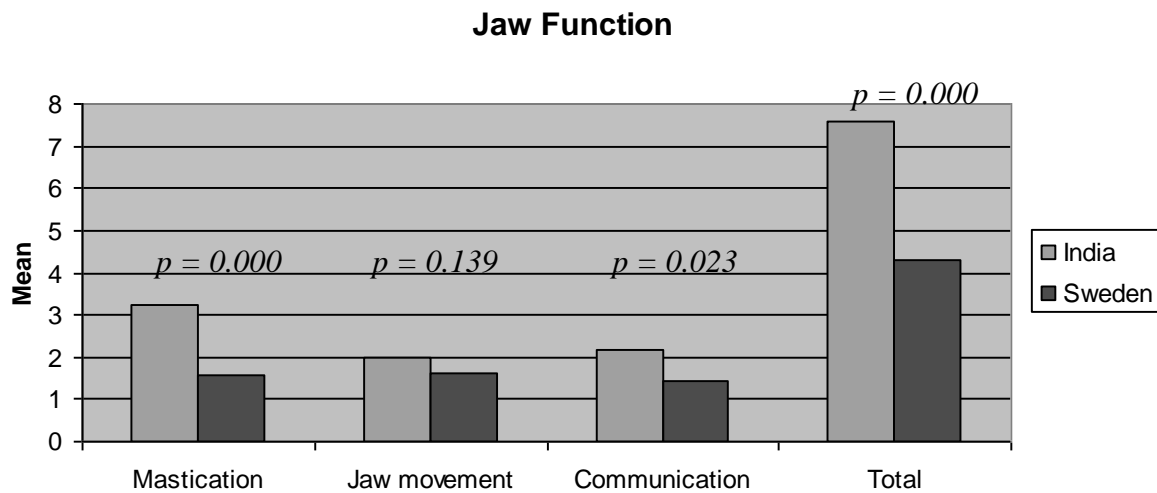
<b>Frequency of headache</b>	<b>%</b>	<b>n</b>
Every second day or more often (CTTH)	2.5	22
Every week (FETTH)	35.3	317
Less than once a month (IETTH)	25.2	226
Never	37.0	332

**Table 5.** Consequences of TMD pain in India and Sweden.

<b>Variables</b>	<b>TMD India</b>	<b>TMD Sweden</b>	<b>P</b>
Pain intensity (mean)	2.32	3.13	0.006
School absence (%)	26.2	23.9	0.657
Treatment need (%)	62.7	60.2	0.662
Medication (%)	14.5	26.0	0.017

**Table 6.** How prevalence of TMD pain changes with age and gender in Sweden and India. In the age of 12, 16 and 17 years among the Indian subjects, the number of respondents was very low.

Age / TMD pain	India n (%)		Sweden n (%)	
	Boys	Girls	Boys	Girls
12	0 (0.0)	1 (25.0)	2480 (2.0)	2257 (2.7)
13	3 (5.5)	4 (8.2)	1787 (2.7)	1563 (3.6)
14	35 (17.7)	27 (14.2)	1950 (2.8)	1843 (4.3)
15	17 (13.5)	39 (18.6)	1740 (2.6)	1653 (5.5)
16	8 (22.2)	6 (28.6)	2054 (2.1)	1800 (8.3)
17	0 (0.0)	0 (0.0)	1488 (3.8)	1385 (8.2)



**Figure 1.** This figure reveals functional limitations due to pain in the craniofacial region. The prevalence of limitations was generally higher in India than in Sweden.