

Nasal Septum Deviation by Age and Sex in a Study Population of Poles

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Abstract: *Introduction:* Nasal septum deviation is found in nearly 79% of all autopsies. A displacement of the nasal septum is caused by developmental disorders, which result in growth disproportions between different skeletal structures, as well as hereditary factors, and injuries to the nose and the facial skeleton.

Aims: This study aims is to estimate the incidence of nasal septum deviation in a study population of Poles, with a breakdown by age and sex.

Subjects and method(s): The people involved in the study were a group of 950 randomly selected residents of a large city. The subjects were aged between 6 and 76 years. The method used in the study was anterior rhinoscopy in combination with clinical history taking.

Results: The investigation revealed that the number of cases of nasal septum deviation diagnosed on the basis of anterior rhinoscopy increases steadily with age, from 15% in children aged 7-8 years to 39.7% in adults ($p < 0.05$). The results of the study show that men are more frequently diagnosed with nasal septum deviations than women are ($p < 0.05$).

Conclusions: A relatively large percentage of nasal septum deviations was observed in a population of Poles, with a breakdown by age and sex.

Keywords: Nasal cavity, nasal septum deviation.

INTRODUCTION

The nasal cavity, enclosed by the inner surface of the external nose and bones, stretches from the cranial base to the roof of the mouth, occupying the upper and middle parts of the facial skeleton. The nasal cavity is divided by the nasal septum into two almost symmetrical parts. These open with the anterior nares to the front and are connected with the nasopharynx through posterior nares. Each of these halves of the nasal cavity has four walls: a top wall, a bottom wall, a medial wall, and a lateral wall. The medial wall, i.e., the nasal septum, is the main support of the bone and cartilage framework of the nose, and it is the base for the mucous membrane, which plays a vital role in functional terms. The nasal septum consists of three parts: a membranous part (comprising an inner skin layer and an outer skin layer), a cartilage part (nasal septum cartilage) and a bone part (the perpendicular plate of the ethmoid bone and the vomer) [1]. The nasal septum is hardly ever perfectly straight. Hereditary factors, developmental processes, and injuries cause displacements of the nasal septum. Nasal septum deviations are diagnosed in between 62% and 80% of adults [2-4]. This condition is one of the most common causes of nasal patency disorders. It

accompanies and contributes to diseases such as snoring, obstructive sleep apnea syndrome (OSAS) or the chronic inflammatory paranasal sinus disease [5]. This study aims to estimate the incidence of nasal septum deviation in a population of Poles, with a breakdown by age and sex.

SUBJECTS AND METHOD(S)

The population in the study was a group of 950 randomly selected residents of a large city. The subjects were aged between 6 and 76 years. Patients with any of the following, based on the history taken, were excluded from the study: nasal surgery, paranasal sinus surgery, injuries resulting in severe deformities of the bone and cartilage parts of the nose, acute infection of the upper airways, inflammation of the mucous membrane of the nose accompanying symptoms of nasal septum deviation, nasal polyps, nasopharyngeal polyps, pregnancy, mental disorders and lack of cooperation by the subject. The subjects meeting the above criteria were included in the analysis. Of the 950 people, 638 patients were included in the study (329 women (52%) and 309 men (48%)). Each of the adult patients signed an informed consent form before joining the study. For patients under the age of 18, these statements were signed by their parents or legal guardians. The average age of the patients was 15.3 years (the age range is 6 to 76 years). The 6-12 age group was a randomly selected

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group of children attending years one to six at two primary schools in the Warsaw area. The 13-15 age group was a randomly selected group of children attending years one to three at a lower-secondary school in Warsaw. The 16-19 age group was a randomly selected group of children attending years one to three at an upper-secondary school in Warsaw. The adult group (patients aged 18 or older) a randomly selected group of healthy personnel employed by pharmaceutical manufacturing facilities operated by Bioton and located in the Warsaw area. The 65+ age group was patients who visited an outpatient hospital clinic for consultations with an allergist or an ENT doctor. The analysis is based on group age according to the following:

- Each age group must have at least 30 patients.
- The age distribution of the study groups should be even, but with smaller age ranges for youth subjects, i.e., two years until the age of 17 (the isolated six-year-old children, attending year one at primary schools, were included in the 7-8 age group).

Because of the large number of subjects and the random selection approach, the study was an attempt to estimate the incidence of nasal septum deviation cases depending on the age and sex of the people included in the study. Each of the patients was examined using the anterior rhinoscopy method. The

examination covered the classification of the patient's nasal septum deviation as either an anterior septal deviation or posterior septal deviation.

- A septal deviation is anterior if the deformity is found in field one in a Cottle test (the nasal vestibule region) or field two in Cottle test (the nasal valve field).
- A septal deviation is posterior if the deformity is found in field four in a Cottle test (the anterior concha field) or field five in Cottle test (the posterior concha field) [1].

The deviation of the nasal septum was assessed using the Turbinate / Septum (T/S) scale (grades 1 - 3).

- Grade 1: the medial and lateral edges of attachment of the middle nasal concha is identified in an anterior rhinoscopy examination.
- Grade 2: the anterior attachment of the middle nasal concha is partially obscured by a deformed nasal septum, as found in an anterior rhinoscopy examination.
- Grade 3: the anterior attachment of the middle nasal concha is fully obscured, as seen on an anterior rhinoscopy examination. The anterior rhinoscopy examination involved the use of metal nasal specula both before and after

Table 1: Characteristics of the Age Group

a) By age

Age (years)	Number (female subjects)	Number (male subjects)	TOTAL	Percentage (%)
6 – 8	62	51	113	17.7
9-10	39	36	75	11.8
11-12	43	66	109	17.1
13-14	42	63	105	16.5
15-16	66	54	120	18.8
≥17	77	39	116	18.2

b) By education

	Women	Men	Age (Average value)	Age (Years)	Total number of subjects
Primary school	144 (48%)	153 (52%)	9.46	6 - 13	297
Lower-secondary school	87 (44%)	109 (56%)	14.28	11 - 17	196
Upper-secondary school	55 (66%)	28 (34%)	16.92	16-19	83
Adults	43 (69%)	19 (31%)	43.87	18 - 76	62
Total	329	309	15.26	6 - 76	638

decongestion of the nasal mucous membrane (the swelling of the nasal septum was assessed before the decongestion, and the nasal septum was assessed after the production of local ischemia in the mucous membrane).

The permission of the Bioethics Committee at the Medical University of Warsaw was obtained for conducting the study. The statistical analysis as part of the study was based on Pearson's chi-squared test with a significance level of $p < 0.05$.

RESULTS

Incidence of Nasal Septum Deviation Cases Depending on the Age of the Subjects

The results of the study indicate a statistically significant correlation between the patients' nasal septum deviation and the age of the patients ($p < 0.00005$). The number of cases of nasal septum deviation increases with age, from 15% in children aged 7-8 years to 39.7% in adults. However, there is no statistically significant correlation between the direction of the nasal septum deviation and the age or sex of the subjects.

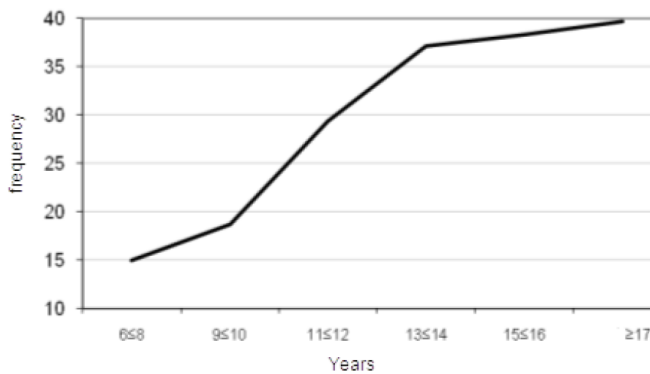


Figure 1: Incidence of nasal septum deviation depending on the age of the subjects.

Incidence of Nasal Septum Deviation Depending on the Age of the Subjects

The results of the study show that the number of nasal septum deviation cases is higher for boys than it is for girls (except for the 13-14 age group). The difference in the number of cases of the nasal septum deviation condition between boys and girls was significant only in the 9-10 and 11-12 age groups ($p < 0.02$). In the case of children under the age of 8 and those between the ages of 13 and 16, no statistically significant correlation was found between girls and

boys as regards the incidence of nasal septum deviation. However, in the adult group, men are more frequently diagnosed with nasal septum deviations than women are ($p < 0.05$).

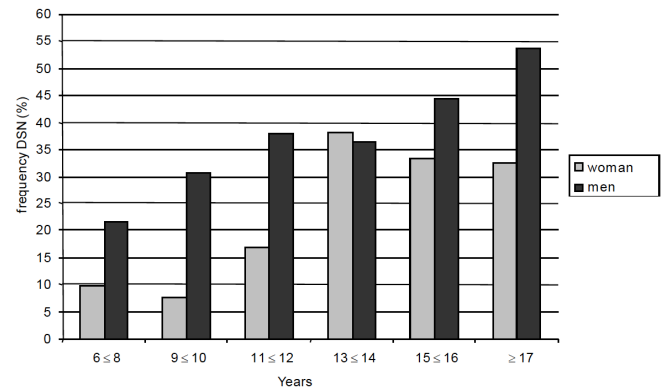


Figure 2: Incidence of nasal septum deviation depending on the sex of the subjects.

Incidence of Nasal Septum Deviation Depending on the Sex of the Subjects

The study shows a statistically significant correlation between the type of the nasal septum deviation and the patient's sex, in the adult group (based on the Pearson's chi-squared test with a significance level of $p < 0.05$). In the adult age group, the posterior deviation was found in 31 of the 79 women (39%) and 30 of the 115 men (26%). The probability of posterior nasal septum deviation in the case of women as compared to men was 1.8: 1.0. The differences as regards the incidence of anterior deviation were not as high. The rate of this type of variation in men (60%) is slightly higher than in the case of women (56%). The probability of anterior nasal septum deviation in the case of men as compared to women was 1.2:1.0.

The study included an analysis of the incidence of the nasal septum deviation condition depending on the direction (i.e., rightward or leftward deviation), broken down by sex and age group. This analysis revealed no statistically significant differences in this regard between men and women. With the results of men and women combined, the study showed 60.5% of rightward nasal septum deviations (112 of the 185 adults) and 39.4% of left deviations (73 of the 185 adult cases). The results show that the number of rightward nasal septum deviation cases is considerably higher ($p < 0.002$). The study distinguishes between two nasal septum deviation directions: rightward and leftward. The total number of patients included in the study was 638. Of the 638 subjects, 194 (30.4%) were diagnosed

Table 2: The Number of Cases of Anterior and Posterior Nasal Septum Deviation, Broken Down by Age Group, for Men and Women

Age (years)	Women (DSN)		Women Total number	Men (DSN)		Total number
	Anterior nasal septum deviation	Posterior nasal septum deviation		Anterior nasal septum deviation	Posterior nasal septum deviation	
6-8	5	1	62	6	4	51
9-10	2	0	39	9	1	36
11-12	2	3	43	18	3	66
13-14	8	8	42	13	9	63
15-16	13	9	66	12	8	54
≥17	14	10	77	11	5	39
Total for the groups	44	31	329	69	30	309

Table 3: An Analysis of the Incidence of Nasal Septum Deviation Depending on the Direction of the Deviation (Rightward, Leftward or Mixed) Broken Down by Age Group**a) Women**

Women Age group (years)	Healthy patients (no nasal septum deviation found)	Deviation direction		
		Rightward	Leftward	Mixed
6-8	56	5	1	0
9-10	36	3	0	0
11-12	36	3	2	2
13-14	26	11	5	0
15-16	44	14	8	0
>17	52	13	11	1
Total for the groups	250	49	27	3

b) Men

Men Age group (years)	Healthy patients (no nasal septum deviation found)	Deviation direction		
		Rightward	Leftward	Mixed
6-8	40	6	5	0
9-10	25	5	6	0
11-12	41	13	8	4
13-14	40	14	9	0
15-16	30	11	12	1
>17	18	14	6	1
Total for the groups	194	63	46	6

with the 1st grade nasal septum deviation. No nasal septum deviation was found in 444 of the patients (69.6%).

The results of the study show that men are significantly more frequently diagnosed with nasal septum deviations than women are ($p < 0.05$) in the adult group. The research has revealed that the number of cases of nasal septum deviation increases

steadily with age, from 15% in children aged 7-8 years to 39.7% in adults. Rightward nasal septum deviations are more frequent in both men and women.

DISCUSSION

The nasal septum is the primary support of the bone and cartilage framework of the nose. The correct anatomy of the nasal septum largely determines the

nature of the flow of air through the nose. The nasal septum is hardly ever perfectly straight — nasal septum deviation found in nearly 79% of all autopsies [4,6]. The nasal septum is a complex anatomical structure, and the framework of the nasal septum may be affected by various pathological processes. A displacement of the nasal septum is caused by developmental disorders, which result in growth disproportions between different skeletal structures, as well hereditary factors, and injuries to the nose and the facial skeleton [2].

In many cases, the nasal septum deviation condition is a result of direct injuries to the nose, often accompanied by fractures of the nasal bone and/or other parts of the facial skeleton. The severity of such injuries and the resulting lesions depends on the force of the impact, the direction of the force and the object that caused the damage. The nose is positioned centrally in the face region and is a protruding structure, which makes it particularly prone to injuries. Injuries to the anterior part of the nose usually result in damage to nasal cartilages, as these parts are the first to cushion the impact. Injuries to the lateral parts of the nose result in fractures of the long axis of the nasal bones and cause damage mainly to the regions subjected to the impact. Such injuries cause damage to the cartilages and bones of the nasal septum in various configurations. Depending on the impact factor, the resulting damage may include subcartilaginous or subperiosteal fractures or fractures of cartilages and/or bones with dislocation [2]. It is often the case that patients diagnosed with nasal septum deviations deny ever suffering from any nose or facial skeleton injuries in the past [7,8]. In some of these patients, the nasal septum deformity may be linked with an incorrect intrauterine position of the foetus and/or perinatal injuries. Postnatal nasal septum deviations are most frequently diagnosed in the case of children with heavy birth weight, born through natural delivery by first-time mothers, particularly if the second delivery period was longer than 15 minutes [8]. Developmental disorders of the facial skeleton may also be a factor in the development of nasal septum deviations. In their work, Kim and colleagues described a correlation between the development of a nasal septum deviation and innate facial asymmetry, particularly horizontally, in patients with no past nose injuries. The authors prove that the asymmetry of facial skeleton bones may be a factor in the development of nasal septum deviations [7].

In the group of patients included in the study (638), the nasal septum deviation condition was found in 194

subjects (30.4%). This group included 79 (24.0%) women and 115 (37.2%) men, indicating that the condition was more frequent in the case of men. This finding is consistent with results reported in the literature [9]. In 2005, Pires de Oliveira and colleagues invited 534 volunteers to participate in a study that found the nasal septum deviation condition in 322 (60.3%) of the subjects, with more cases of the condition found in men than in women [10]. Min and colleagues found the nasal septum deviation condition in 22.38% of the 9284 people included in their study, with more men than women with this condition [11]. In 2017, Sriprakash's investigation found the nasal septum deviation condition in 138 (30.9%) of the 446 patients included in his study. In this group, more men than women suffered from the nasal septum deviation condition [12].

There is no standard classification of nasal septum deviation grades. In our study, the degree of deviation was assessed using the Turbinate / Septum (T/S) scale (grades 1 - 3), with two deviation directions: rightward or leftward. In 2015, a review of the literature by Teixeira and colleagues found that there were a number of classifications in use, with the one most commonly used being a classification, proposed by Lawson in 1978, of the twisted nose into two basic types: the C shaped and S-shaped twist. Vidigal and colleagues used the T/S scale in their assessments of nasal septum deformities [13].

Our study has revealed that the number of cases of nasal septum deviation increases steadily with age, from 15% in children aged 7-8 years to 39.7% in adults. Min and colleagues also prove that the incidence of the nasal septum deviation condition increases with age [11]. Subaric and Mladina have found the nasal septum deviation condition in 21% of children aged 7-14 and 41.8% of adults [14]. Gray's 1978 study that included 2380 newborns examined after birth shows that 42% of the new-borns had a normal nasal septum, 27% had a deviated nasal septum, and 31% had a fractured nasal septum. The same author examined the skulls of adults from five ethnic groups and found that 21% of the subjects had a normal nasal septum, 37% had a deviated nasal septum and 41% had a fractured nasal septum. This can lead to the conclusion that the incidence of the nasal septum deviation condition may increase with age [4].

CONCLUSION

The nasal septum deviation condition is a very widespread pathology, which often leads to nasal

patency disorders. However, some patients do not show any symptoms of the condition, which may be diagnosed accidentally in the course of an examination by an ETN doctor.

REFERENCES

- [1] Bochenek A, Reicher M. The human anatomy. PZWL, Warsaw 1992; 2.
- [2] Bailey BJ. Head and Neck Surgery-Otolaryngology. Lippincott WW 2001; 1.
- [3] Rehman A, Hanid S, Ahmad M, *et al.* A prospective study of nasal septal deformities in Kashmiri population attending a Tertiary care hospital. *International Journal of Otolaryngology and Head and Neck Surgery* 2012; 1: 77-84. <https://doi.org/10.4236/ijohns.2012.13016>
- [4] Gray LP. Deviated nasal septum. Incidence and etiology. *Ann Otol Rhinol Laryngol* 1978; 87: 3-20. <https://doi.org/10.1177/00034894780873S201>
- [5] Orlandi RR. A systematic analysis of septal deviation associated with rhinosinusitis. *Laryngoscope* 2010; 120(8): 1687-95. <https://doi.org/10.1002/lary.20992>
- [6] Mohebbi A, Ahmadi A, Etemadi M, *et al.* An epidemiologic study of factors associated with nasal septum deviation by computed tomography scan: a cross sectional study. *BMC Ear, Nose and Throat Disorders* 2012; 12: 15. <https://doi.org/10.1186/1472-6815-12-15>
- [7] Kim, YM, Rha K-S, Weissman JD, *et al.* Correlation of Asymmetric Facial Growth with Deviated Nasal Septum. *Laryngoscope* 2011; 121: 1144-8. <https://doi.org/10.1002/lary.21785>
- [8] Wang J, Dou X, Liu D, *et al.* Assessment of the effect of deviated nasal septum on the structure of nasal cavity. *Eur Arch Otorhinolaryngol* 2016; 273: 1477-80. <https://doi.org/10.1007/s00405-015-3770-y>
- [9] Chisholm EJ, Hajioff D, Kotecha B. Influence of ethnicity on the frequency of nasal surgery. *Rhinology* 2006; 44: 1-204.
- [10] Oliveira AKP, Junior EE, Santos LV, *et al.* Prevalence of deviated nasal septum in Curitiba, Brasil. *Int Arch Otorhinolaryngol* 2005; 9(4): 288-92.
- [11] Min Y, Jung HW, Kim CS. Prevalence study of nasal septal deformities in Korea; results of a nation-wide survey. *Rhinology* 1995; 33: 61-65
- [12] Sriprakash V. Prevalence and clinical features of nasal septum deviation: a study in an urban centre. *Int J Otorhinolaryngol Head Neck Surg* 2017; 3(4): 842-4. <https://doi.org/10.18203/issn.2454-5929.ijohns20173670>
- [13] Teixeira J, Certal V, Chang ET, *et al.* Nasal septal deviations: a systematic review of classification systems. *Plastic Surgery International* 2016; Article ID 7089123, 8 pages.
- [14] Subaric M, Mladina R. Nasal septum deformities in children and adolescent: a cross sectional study of children from Zagreb, Croatia. *Int J Pediatr Otorhinolaryngol* 2002; 63(1): 41-8. [https://doi.org/10.1016/S0165-5876\(01\)00646-2](https://doi.org/10.1016/S0165-5876(01)00646-2)

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