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# ASSESSMENT OF HIATAL HERNIA DIAGNOSED IN PATIENTS WITH GASTROESOPHAGEAL REFLUX DISEASE BY ESOPHAGEAL MANOMETRY

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The purpose of the study was to assess the diagnostic significance (sensitivity and specificity) of hiatal hernia detected by esophageal manometry in patients with gastroesophageal reflux complaints and in persons who were referred for a "check-up" without complaints. 60 patients with gastroesophageal reflux disease who applied with complaints of gastroesophageal reflux (main group) and 35 patients who applied for the purpose of "check-up" (control group) were included in our study. In 95 patients who underwent esophagogastroduodenoscopy, additional esophageal manometry and 24-hour esophageal impedance pH-metry were performed. The sensitivity for endoscopic hiatal hernia in the diagnosis of hiatal hernia on esophageal manometry was 87.5±5.2 %, and the specificity was 70.9±6.1 %. The sensitivity for the esophagus biopsy was 88.9±10.5 %, and the specificity was 100.0±0.0 %. For integrated relaxation pressure-4sec sensitivity was 62.5±7.7 %, specificity was 75.5±5.9 %. In total statistical analysis revealed 100 % specificity and 88.9 % sensitivity of esophageal manometry in diagnosing hiatal hernia. Thus, a significant correlation was found between hiatal hernia detected on esophageal manometry and 24-hour esophageal impedance pH-metry. The use of these methods in the diagnosis of hiatal hernia can lead to an increase in the effectiveness of the prevention of pathological conditions associated with hiatal hernia.

**Key words**: hiatal hernia, 24-hour esophageal impedance pH-metry, esophagogastroduodenoscopy, sensitivity, specificity

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# ОЦІНКА ГРИЖІ СТРАВОХІДНОГО ОТВОРУ ДІАФРАГМИ, ДІАГНОСТОВАНОЇ У ПАЦІЄНТІВ ІЗ ГАСТРОЕЗОФАГЕАЛЬНОЮ РЕФЛЮКСНОЮ ХВОРОБОЮ ПРИ ПРОВЕДЕННІ ЕЗОФАГЕАЛЬНОЇ МАНОМЕТРІЇ

Метою дослідження було оцінити діагностичну значущість (чутливість та специфічність) гриж стравохідного отвору діафрагми, виявлених при стравохідній манометрії у хворих зі скаргами на гастроезофагеальний рефлюкс та у осіб, які звернулися з метою обстеження без скарг. До нашого дослідження було включено 60 пацієнтів, які звернулися зі скаргами на гастроезофагеальний рефлюкс (основна група) та 35 пацієнтів, які звернулися з метою обстеження (контрольна група). 95-м хворим, яким була виконана езофагогастродуоденоскопія, додатково виконували езофагеальну манометрію та 24-годинну імпедансну pH-метрію стравоходу. Чутливість ендоскопічної грижі стравохідного отвору діафрагми у діагностиці грижі стравохідного отвору діафрагми за даними манометрії стравоходу становила 87,5±5,2 %, специфічність – 70,9±6,1 %. Чутливість біопсії стравоходу становила 88,9±10,5 %, специфічність 100,0±0,0 %. Для інтегральної релаксації тиск-4 становив 62,5±7,7 % чутливості та 75,5±5,9 % специфічності. Загалом статистичний аналіз виявив 100 % специфічність та 88,9 % чутливість езофагеальної манометрії у діагностиці грижі стравохідного отвору діафрагми. Таким чином, виявлено достовірну кореляцію між грижею стравохідного отвору діафрагми, виявленої при стравохідній манометрії, та 24-годинною імпедансною pH-метрією стравоходу. Використання цих методів у діагностиці грижі стравохідного отвору діафрагми може призвести до підвищення ефективності профілактики патологічних станів, пов'язаних із грижею стравохідного отвору діафрагми.

**Ключові слова:** грижа стравохідного отвору діафрагми, 24-годинна імпедансна pH-метрія стравоходу, езофагогастродуоденоскопія, чутливість, специфічність.

As it is known, hiatal hernia (HH) is common in patients with gastroesophageal reflux. Studies show that hiatal hernia significantly increases the risk of gastroesophageal reflux disease (GERD) [10]. GERD has taken a leading place among all pathologies of the upper gastrointestinal tract and is one of the most relevant and widely studied problems of modern gastroenterology [5]. High-resolution esophageal manometry is an important examination method in the diagnosis of functional esophageal diseases [13]. Classical diagnosis of hiatal hernia was based on endoscopy and barium X-ray examination [3]. However, the diagnosis of HH by these methods has serious disadvantages. So, these examinations are methods related to photo technique. However, high-resolution esophageal manometry is a more dynamic and long-term examination method, allowing to analyze the pressure components of the lower esophageal sphincter and comprehensively examine this anatomical region [12].

It should be noted that low esophageal sphincter pressure in patients with HH leads to more serious esophageal injuries. In GERD without HH, the main cause is motor dysfunction of the esophagus [7].

**The purpose** of the study was to assess the diagnostic significance (sensitivity and specificity) of hiatal hernia detected by esophageal manometry in patients with gastroesophageal reflux complaints and in persons who were referred for a "check-up" without complaints.

**Materials and methods.** 60 GERD patients who applied with complaints of gastroesophageal reflux (main group) and 35 patients who applied for the purpose of "check-up" (control group) were included in our study. In 95 patients who underwent esophagogastroduodenoscopy (EGD) additional esophageal manometry (EM) and 24-hour esophageal impedance pH-metry were performed. 60 of them (63.1 %) were men, 35 (36.9 %) were women. The mean age of the patients was 41.1±1.6 yeas (20–70).

Esophagogastroduodenoscopy was performed on all patients in both the main and control groups using Olympus CV and Fujinon special devices. During endoscopic examination, the degrees of esophagitis were evaluated according to the Los-Angeles classification (1994) (Grade A, B, C, D).

According to the results of endoscopy, 51 patients (53.6 %) had a rupture of the esophageal hiatus of the diaphragm, and 27 patients (28.4 %) had insufficiency of the gastric cardia. According to the Los Angeles classification, 19 patients (38.8 %) with erosive GERD had Grade A esophagitis, 17 (34.6 %) had Grade B esophagitis, and 13 (26.6 %) had Grade D esophagitis. Grade C esophagitis was not detected in any patient.

All patients were subjected to EM and 24-hour esophageal impedance pH-metry. The lower esophageal sphincter pressure, IRP- integrated relaxation pressure, DCI- distal contractile integral, peristaltic breaks, and hiatal hernia were evaluated by EM. By 24-hour esophageal pH-metry the type of reflux, the spectrum, total reflux time (with pH<4; %), standing reflux time and lying reflux time (minutes), number of reflux periods, lasting more than 5 min., number of refluxes, longest reflux, De-Meester score, adult score, symptom index, Symptom Association Probability (SAP) were evaluated.

According to the type of reflux, 37 patients (39 %) had acid reflux, 40 patients (42 %) had weak acid reflux, and 10 patients (10.5 %) had weak alkaline reflux. Absence of reflux was detected in 8 patients (8.5 %). When examining the spectrum of reflux, it was found that 16 patients (16.8 %) had liquid, 33 patients (34.7 %) had gas, and 38 patients (40.0 %) had mixed reflux.

Statistical analysis was performed using SPSS-26 package program. Descriptive data were expressed as mean ± Standard Error of Mean, median, quartile 1 and quartile 3, 95 % Confidence Interval. The $c^2$-criterion (Chi-square Pearson) was used to compare quality indices. The distribution of variables was checked with the t-Student-Bonferroni and U Mann-Whitney test. Frequencies between the groups of patients were compared on the basis of the OR (odds ratio) test. The impact of exposure factor was evaluated by the Fisher-Snedecor criterion. The null hypothesis was rejected at $p<0.05$. The integral value (ROC-curve) for the sensitivity and specificity parameters was constructed in the entire variation range of the studied parameters in the ROC-analysis binary classification model. At this time, the area under the ROC-curve (AUROC) was calculated and the result was evaluated statistically. The detection of the cut of point, which is the farthest point of the ROC-curve from the reference line, made it possible to use the test as a selection criterion in subsequent studies. The algorithm presented in previous articles was used in the construction of the mathematical model [1, 4, 6].

**Results of the study and their discussion**. Hiatal hernia was detected in 40 out of 95 patients (42 %) by EM. HH was more common in men than in women. Thus, 75 % of patients diagnosed with HH were men (p=0.041). Of the complaints, only dysphagia and HH were significantly correlated (p=0.048). Thus, in 81.8 % of patients with dysphagia complaints, HH was not detected in EM. Also, a significant relationship was found between HH and the type and spectrum of reflux from 24-hour impedance pH-metry indices (p=0.004 and p=0.014, respectively). Thus, acid reflux was observed in 57.5 % of patients with HH detected in the EM. Regarding the spectrum of reflux, mixed reflux was seen in 47.5 % of these patients.

In 12.5 % of patients with HH detected on EM (HH(EM)), HH was not seen in endoscopy (p<0.000). On the contrary, HH was observed in endoscopy in 29.1 % of patients in whom HH was not detected by EM. From the endoscopic indicators, a significant relationship was also found between endoscopic esophagitis and HH detected by EM (p=0.026). Thus, in 85.7 % of patients diagnosed with Grade D esophagitis, HH was detected in EM. In 20.0 % of patients with HH found out by EM, Barrett's esophagus was seen in endoscopy (p=0.010).

A significant correlation was found between hiatal hernia and a biopsy (bx) taken from the mucous membrane in the distal part of the esophagus during endoscopy (p=0.038). Thus, among patients with HH detected in manometry, in 55.6 % cases esophagitis, in 33.3 % cases Barrett's esophagus and in 11.1 % cases normalreasuts of biopsy were found. In patients without HH esophagitis and Barrett's were not observed, and the mucous membrane was noted to be normal.

According to our results a significant relationship between esophageal motor disorders and HH (p=0.009) was detected. Thus, in 42.5 % of patients with HH determined by EM, no motor changes were recorded, 27.5 % of patients with HH had ineffective esophagus, and 17.5 % had fragmented peristalsis. Other

motor disorders (hypercontractile esophagus, achalasia) were found in 12.5 % of patients. In 76.4 % of patients without HH according to EM results, motor changes in the esophagus were not observed. Ineffective esophagus was detected in 12.7 % of patients, and fragmented peristalsis was seen in 3.6 % of patients.

Functional fermentation was observed in 24-hour impedance pH-metry in 7.5 % of patients with HH detected in EM. So, pathological reflux was not found in impedance pH-metry in these patients (p=0.019). SAP+ pathological reflux was observed in 37.5 % of patients with HH detected in EM. Only the number of reflux periods indicator was found to be significant (p=0.008). Thus, the number of reflux periods in those patients was higher compared to patients who did not detect HH in EM.

During the evaluation by Student-Bonferroni method, it was found that only the number of reflux periods was more than the 24-hour esophageal impedance pH-metry indices in patients with HH compared to patients without HH (p=0.006). According to the Mann-Whitney criterion, a significant correlation was found between gender, duration of illness and dysphagia with HH detected on EM (p=0.042, p=0.038 and p=0.050, respectively).

Among the endoscopic indices, a significant relationships were also observed between endoscopic HH, insufficiency of gastric cardia, endoscopic esophagitis and endoscopic Barrett's esophagus (p<0.001, p<0.001, p=0.009 and p=0.011, respectively). A significant relationship was found between distal contractile integral (DCI) and IRP from HH and EM indicators (p=0.032 and p=0.018, respectively). Thus, the DCI index in these patients was significantly less compared to patients without HH, that is, peristalsis disorder in the distal part of the esophagus was seen significantly more (p<0.001). Also, the integrated relaxation pressure index in these patients was significantly lower than in patients without HH.

According to the Mann-Whitney criterion, significant relationships were found between HH (EM) and impedance pH-metry indices; total reflux time ( %), standing reflux time (min.), number of reflux periods and number of reflux periods lasting more than 5 min. (p=0.043, p=0.014, p=0.014 and p=0.047, respectively). Thus, these indicators were significantly higher in patients with HH (Table 1).

Table 1

**Relationship between hiatal hernia and 24-hour impedance pH-metry indicators in patients with hiatal hernia on esophageal manometry**

| | | HH (EM) | | Pt | $P_U$ |
|---|---|---|---|---|---|
| | | "–" | "+" | | |
| Total reflux time (pH<4)– % | M | 14.7 | 21.1 | >0.05 | 0.006* |
| | Me | 6.4 | 163 | | |
| | Q1 | 2.5 | 6.8 | | |
| | Q3 | 23.3 | 33.5 | | |
| Standing reflux time (min.) | M | 136.0 | 193.4 | >0.05 | 0.005* |
| | Me | 64.9 | 112.3 | | |
| | Q1 | 27.3 | 70.1 | | |
| | Q3 | 158.5 | 258.6 | | |
| Lying reflux time (min.) | M | 63.3 | 77.2 | >0.05 | 0.020* |
| | Me | 9.3 | 28.6 | | |
| | Q1 | 0.0 | 9.7 | | |
| | Q3 | 91.5 | 110.9 | | |
| Number of reflux periods | M | 100.8 | 159.4 | 0.006* | 0.002* |
| | Me | 69.0 | 112.0 | | |
| | Q1 | 27.0 | 84.0 | | |
| | Q3 | 136.0 | 228.0 | | |
| Number of reflux periods lasting more than 5 minutes | M | 6.49 | 8.80 | >0.05 | 0.004* |
| | Me | 2.00 | 6.00 | | |
| | Q1 | 0.00 | 2.00 | | |
| | Q3 | 9.00 | 11.00 | | |
| Longest reflux (min.) | M | 28.7 | 28.0 | >0.05 | 0.075 |
| | Me | 10.5 | 14.0 | | |
| | Q1 | 3.0 | 9.1 | | |
| | Q3 | 39.8 | 37.2 | | |
| De-Meester score | M | 48.5 | 66.0 | >0.05 | 0.009* |
| | Me | 21.5 | 49.1 | | |
| | Q1 | 10.0 | 23.2 | | |
| | Q3 | 80.8 | 105.2 | | |

Note: the statistical significance of the difference between the indices of the groups: M – mean, Me – median mean, Q1–quartile 1, Q3 –quartile 3, Pt – according to the t-Student-Bonferroni criterion, Pu – according to the U-Mann-Whitney criterion, * – "0" hypothesis is rejected

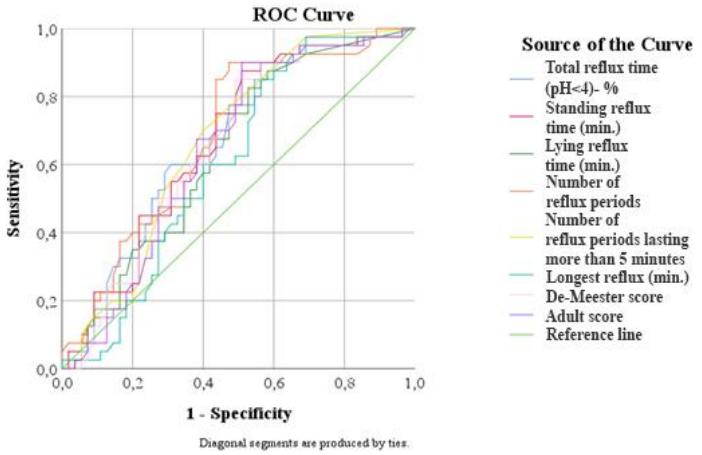


Fig. 1. Results of ROC analysis of 24-hour esophageal pH-metry in the diagnosis of hiatal hernia.

The area under the ROC curve (AUROC), which is an integral parameter of sensitivity and specificity in the diagnosis of HH, were determined for 24-hour esophageal pH-metry indicators. So, for total reflux time (pH<4; %), this index is 0.667±0.056 (p=0.006), for standing reflux tome (min.) and lying reflux time (min.), 0.670±0.055(p=0.005 ) and 0.639 ±0.057 (p=0.021), respectively. For the number of reflux periods, this indicator was calculated as 0.684±0.055 (p=0.002), for the number of reflux periods lasting more than 5 minutes, 0.672±0.055 (p=0.004), and for the DeMeester score, 0.657±0.056 (p=0.009) (Fig. 1).

The results of the ROC curve analysis for EM indices in the diagnosis of HH showed that AUROC was calculated as 0.371±0.061 (p=0.032) for distal contractile integral, and 0.357±0.060 (p=0.018) for IRP 4s. (Fig. 2).

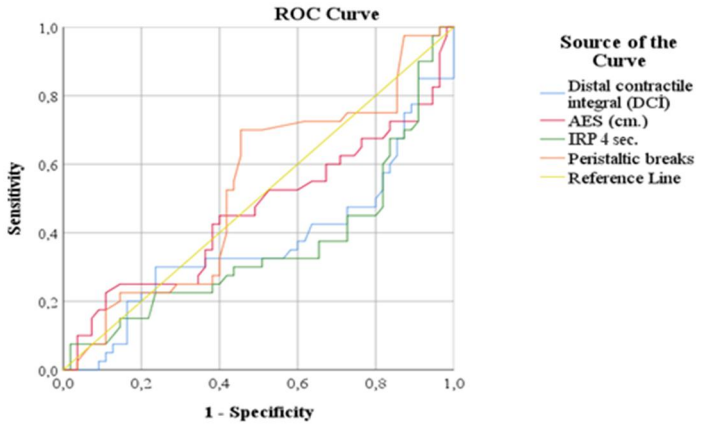


Fig. 2. Results of ROC-analysis according to the indices of esophageal manometry in the diagnosis of hiatal hernia.

The cut-off point for IRP-4s in patients with HH detected on EM was 9.6 (sensitivity 62.5±7.7 %, specificity 75.5±5.9 %). The positive predictive value (pPV) of IRP-4s was 65.8±7.7 %. Accuracy ratio of positive results was calculated to determine its practical significance. The clinical significance of this index was evaluated as “sufficient” with a special scale. Negative predictive value for IRP-4s was 72.7±6.0 %. The practical significance of this result was evaluated as “sufficient”. Thus, the odds ratio for IRP-4s was 4.4 (1.9-10.6). This shows that this indicator has a high statistical significance in patients with HH detected on EM (p<0.05). According to the Fisher-Sneedecor criterion, IRP in the diagnosis of HH by EM has statistical significance (p<0.001) and was 15.4 (10.5-17.8) with a significant effect.

The sensitivity for endoscopic HH in the diagnosis of HH on EM is 87.5±5.2 %, and the specificity is 70.9±6.1 %. The positive predictive value for endoscopic HH was 68.6±6.5 %. Accuracy ratio of positive results was calculated to determine its practical significance. The clinical significance of this indicator was evaluated as “sufficient” with a special scale. Negative predictive value for IRP was 88.6±4.8 %. The practical significance of this result was evaluated as “good”. The odds ratio for endoscopic hiatal hernia was 17.1 (5.7-51.4) in patients with HY detected on EM. This shows that this indicator has a high statistical significance in patients with HH detected on EM (p<0.05). According to the Fisher-Sneedecor criterion, endoscopic HH had a significant effect on the diagnosis of HH on EM and was 94.0 (48.1-52.4) and was statistically significant (p<0.001).

The sensitivity for the esophagus biopsy (bx.) in the diagnosis of HH on EM is 88.9±10.5 %, and the specificity is 100.0±0.0 %. Esophagus bx positive predictive value was 100.0±0.0 %. Accuracy ratio of positive results was calculated to determine its practical significance. The clinical significance of this index was assessed as “excellent” using a special scale. Negative predictive value of esophagus bx. was 66.7±27.2 %. The practical significance of this result was evaluated as “good”.

In patients with HH detected on EM, for esophagus bx. odds ratio was 28.3 (0.9-935.9). It was determined that this indicator was not statistically significant in patients with HH (EM) (p>0.05). According to the Fisher-Sneedecor criteria, in the diagnosis of HH (EM), see the esophagus. showing a significant effect, it was 19.3 (47.7-79.7) and has statistical significance (p=0.001).

Specificity and sensitivity according to 24-hour impedance pH-metry indices in the diagnosis of HY in HCV are shown in Table 2.

Table 2

**Informativeness of 24-hour esophageal impedance-pH-metry indices in the diagnosis of hiatal hernia detected on esophageal manometry**

| NN | Total reflux time (pH<4)- % | Standing reflux time (min.) | Lying reflux time (min.) | Number of reflux periods | Number of reflux periods lasting more than 5 minutes | Longest reflux (min.) | DeMeester score | Adult score |
|---|---|---|---|---|---|---|---|---|
| Cut off point | > 5.5 | > 65 | > 8 | > 70 | > 2.5 | > 7.5 | > 22 | > 22.5 |
| n+ | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| ++ | 36 | 32 | 33 | 36 | 28 | 34 | 34 | 36 |
| Sn | 90.0 | 80.0 | 82.5 | 90.0 | 70.0 | 85.0 | 85.0 | 90.0 |
| ±mp | 4.7 | 6.3 | 6.0 | 4.7 | 7.2 | 5.6 | 5.6 | 4.7 |
| n- | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 54 |
| -- | 24 | 28 | 26 | 29 | 33 | 24 | 28 | 27 |
| Sp | 43.6 | 50.9 | 47.3 | 52.7 | 60.0 | 43.6 | 50.9 | 50.0 |
| ±mp | 6.7 | 6.7 | 6.7 | 6.7 | 6.6 | 6.7 | 6.7 | 6.8 |
| ODV | 60 | 60 | 59 | 65 | 61 | 58 | 62 | 63 |
| % | 63.2 | 63.2 | 62.1 | 68.4 | 64.2 | 61.1 | 65.3 | 66.3 |
| ±mp | 4.9 | 4.9 | 5.0 | 4.8 | 4.9 | 5.0 | 4.9 | 4.8 |
| pPV | 53.7 | 54.2 | 53.2 | 58.1 | 56.0 | 52.3 | 55.7 | 57.1 |
| ±mp | 6.1 | 6.5 | 6.3 | 6.3 | 7.0 | 6.2 | 6.4 | 6.2 |
| nPV | 85.7 | 77.8 | 78.8 | 87.9 | 73.3 | 80.0 | 82.4 | 87.1 |
| ±mp | 6.6 | 6.9 | 7.1 | 5.7 | 6.6 | 7.3 | 6.5 | 6.0 |
| LR+ | 1.60 | 1.63 | 1.56 | 1.90 | 1.75 | 1.51 | 1.73 | 1.80 |
| | insufficient | insufficient | insufficient | insufficient | insufficient | insufficient | insufficient | insufficient |
| LR- | 0.23 | 0.39 | 0.37 | 0.19 | 0.50 | 0.34 | 0.29 | 0.20 |
| | sufficient | sufficient | sufficient | good | insufficient | sufficient | sufficient | sufficient |

Note. Sn- sensitivity; Sp – specificity; ODV- overall diagnostic value; pPV (nPV) – positive (neqativ) predictive values; (LR+) positive likelihood ratio; (LR–) negative likelihood ratio

In our study a significant relationship was found between endoscopic esophagitis and HH detected by EM (p=0.026). Some foreign researchers have also studied the relationship between HH and esophagitis. So, Sun X et al. (2014), studying 244 patients, found that the frequency of HH detected on EM was significantly higher in the reflux-esophagitis group than in the non-erosive reflux group (p<0.05) [9]. Leonardo Menegaz Conrado, et al revealed that esophageal dysmotility in patients with and without hiatal hernia was 14.8 % and 7.7 %, respectively (p=0.041) [2].

Several studies have been conducted to evaluate the accuracy of detection of HH on EM. Thus, the study of Weijenborg PW, et al. concluded that EM had a sensitivity of 92 % and a specificity of 95 % for the detection of HH. According to the results of their study, the detection and size determination of HH by EM is more informative than the detection of HH by endoscopy examination [11]. In the other study Shah-Khan SM, et al. found that identification of HH using high resolution manometry had high specificity (99.1 %), but low sensitivity (11.4 %) [8].

## Conclusion

A significant correlation was found between HH detected on EM and 24-hour esophageal impedance pH-metry. Statistical analysis revealed 100 % specificity and 88.9 % sensitivity of EM in diagnosing HH.

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## THE BURDEN OF VISUAL IMPAIRMENT AMONG THE CHILDREN IN AZERBAIJAN

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The purpose of the study was to determine the dynamics of the burden of childhood blindness in the Republic of Azerbaijan. The official data of the State Committee on Statistics for 2011–2017 were obtained from the website. The burden of blindness was conducted by determination of the arithmetic mean of the age of the formation of blindness; individual duration of future life after the formation of blindness, arithmetic mean of the age of children at the time of the formation of blindness; calculating of life duration of children by age groups by multiplying the number of blind children in age groups; determining of burden of blindness in childhood as summary of years of future life of blind patients by calendar years. The prevalence rate of blindness was the lowest in 2012 ($17.8\pm0.8^0/_{0000}$), and the highest in 2017 ($30.4\pm1.1^0/_{0000}$). The tendency of burden of blindness is linear, accuracy of linear equation is 57.97 %. During period 2011–2017 the prevalence of blindness among children population changed within the range $17.8–30.4^0/_{0000}$, the main tendency of which is dynamic increasing. The dynamics of the prevalence of blindness among children and its burden in Azerbaijan confirms the importance of developing a plan to reduce this pathology.

**Key words:** childhood blindness, dynamics, prevalence, epidemiology

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## ПОШИРЕНІСТЬ ПОРУШЕНЬ ЗОРУ У ДІТЕЙ В АЗЕРБАЙДЖАНІ

Метою дослідження було визначити динаміку тягаря дитячої сліпоти в Азербайджанській Республіці. Офіційні дані Держкомстату за 2011–2017 роки взято із сайту. Тягар сліпоти визначалося шляхом розрахунку середнього арифметичного віку формування сліпоти; індивідуальної тривалості життя після формування сліпоти, середнього арифметичного віку дітей на момент формування сліпоти; тривалості життя дітей за віковими групами шляхом множення числа сліпих дітей у вікових групах; визначення тягаря сліпоти у дитячому віці як підсумовування років майбутнього життя сліпих хворих за календарними роками. Показник поширеності сліпоти був найнижчим у 2012 році ($17,8\pm0,8^0/_{0000}$), а найвищим у 2017 році ($30,4\pm1,1^0/_{0000}$). Тенденція тягаря сліпоти лінійна, точність лінійного рівняння становить 57,97 %. За період 2011–2017 років. поширеність сліпоти серед дитячого населення змінювалася не більше $17,8–30,4^0/_{0000}$, основний тенденцією якої є динамічне зростання. Динаміка поширеності сліпоти серед дітей та її тягаря в Азербайджані підтверджує важливість розробки плану зниження даної патології.

**Ключові слова:** дитяча сліпота, динаміка, поширеність, епідеміологія.

Blindness in childhood is a serious problem in human society [5, 10]. According to the information given by WHO the quantity of blind people in the world reached 39 million, the share of young people among them is 18 % [8]. Five percent of worldwide blindness involves children younger than 15 years of age; in developing countries 50 % of the population is in this age group. By World Health Organization criteria, an estimated 19 million of the world's children are visually impaired, while 1.4 million are blind: 1.0 million in Asia, 0.3 million in Africa, 0.1 million in Latin America, and 0.1 million in the rest of the world. Approximately 17.5 million children are at a risk of developing low vision. The estimated burden associated with blindness among children is 70 million blind person years [4].

Almost three quarters of blind children live in low-middle-income countries where the prevalence is reported to be as high as 1.5 per 1000 children in contrast to high-income countries where the prevalence is 0.3 per 1000 [6].

Using the UK as a model for high-income countries, from a population-based incidence study, the annual cumulative incidence of severe visual impairment/blindness (SVL/BL) is estimated to be 6/10 000 by age 15 years, with the incidence being highest in the first year of life [10].

There are marked differences in the causes of pediatric blindness in different regions, apparently based on socioeconomic factors.