Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **44** Special Issue-**2** **Year 2023** Page **4757:4767***

FORECAST OF ANNUAL INDICATORS OF INTESTINAL OBSTRUCTION AMONG CHILDREN UNTIL 2030

Farkhod Shavkatovich Mavlyanov
Samarkand Branch of the Republican Research Center for Emergency Medical Care, Samarkand, Uzbekistan

Azim Abrievich Ulugmuratov
Samarkand Branch of the Republican Research Center for Emergency Medical Care, Samarkand, Uzbekistan

Article History

Received: 08 Sept 2023

Revised: 29 Oct 2023

Accepted: 05 Nov 2023

ABSTRACT

Objective: This study aimed to assess the validity of a predictive methodology for estimating the incidence of intestinal obstruction in children, utilizing retrospective data and mathematical calculations. The research focused on the city of Samarkand and its surrounding districts, with the ultimate goal of providing insights for health authorities to develop targeted treatment and preventive measures.

Methods: Retrospective data related to the incidence of intestinal obstruction in children were collected and analyzed using a specified methodology. Mathematical calculations were employed to extrapolate trends and forecast future occurrences. The study extended its scope to include both urban and rural settings in Samarkand, providing a comprehensive understanding of the potential patterns in disease incidence.

Results: The results obtained from the predictive methodology demonstrated its validity in estimating the incidence of intestinal obstruction in children. The forecasted data, specific to the city of Samarkand and its districts, were instrumental in uncovering patterns inherent in disease prediction. Graphical representations were

constructed to visually highlight these patterns, facilitating a deeper understanding for health authorities.
Conclusion: The findings of this study underscore the effectiveness of the employed methodology in predicting the incidence of intestinal obstruction in children. The insights gained from the analysis and forecasted data can serve as valuable tools for health authorities in Samarkand, enabling them to develop targeted treatment and preventive measures. This research contributes to the ongoing efforts to enhance public health strategies, particularly in the context of pediatric intestinal health in the region. Future studies may further refine and expand upon these findings to strengthen the predictive capabilities for improved healthcare planning and implementation.
KEYWORDS: Prognosis, intestinal obstruction, treatment and preventive measures.

INTRODUCTION

The health status of the younger generation is an important indicator of the well-being of society and the state, reflecting not only the current situation, but also a forecast for the future. The algorithm and analysis of the parametric forecast are as follows [1, 2]. In this case, a parametric forecast means a forecast of a function the argument of which changes as a discrete quantity with a constant sampling step. When predicting changes in morbidity over time, the elements of this vector should be numerical values of morbidity measured at regular intervals, namely after a year [3]. A series of annual incidence rates showing changes in a phenomenon over time is a time series.

Using statistical analysis of time series, the following problems were solved:

– identification and description of characteristic trends in changes in the phenomenon over time;

– selection of a statistical model that describes these changes;

– finding missing intermediate values (interpolation) based on available indicators;

– prediction based on available results of future values (extrapolation) of the analyzed series.

Purpose of the study. Develop a forecast method annual rates of intestinal obstruction among children until 2030.

MATERIAL AND METHODS

The materials for the analysis were data from consolidated annual reports for the city of Samarkand and the Samarkand region over an 8-year period (2015–2023).

One of the ways to increase the efficiency of medical care for the population is the scientific validity of planning preventive measures. The basis for the development of targeted plans is the results of retrospective epidemiological analysis and morbidity forecasting

To create a short-term forecast of annual morbidity rates, we have proposed 2 methodological approaches:

- forecasting using the methodology for determining "maximum stability";
- forecasting using regression equation.

To identify and describe trends, various methods are used that provide approximate (visual assessment of the graph or "mental" alignment, "by hand" alignment method) and accurate (least squares) conclusions. Identifying a trend means flattening the actual curve and drawing a line called a trend line (trend or trend line). The trend line shows what the annual rates could theoretically be if the incidence depended only on the factors that form the trend.

The criterion for the correct drawing (or calculation) of a trend line is approximately equal values of the sums of deviations of actual indicators morbidity up and down from the trend line.

A characteristic feature of time series is that the independent variable X is the time factor, and the dependent variable Y is the (changing dependent) relationship between the variables X and Y, which is one-sided, since the time factor does not depend on the variability of the characteristics.

Graphs of time series turn out to be not smoothly moving, but broken lines, since, along with the main reasons that determine the general pattern in the variability of traits, their increase is influenced by numerous secondary reasons that cause random fluctuations: natural disasters, changes in nutrition, environmental deterioration, accidental emissions of harmful substances into the atmosphere, epidemics, etc. To identify the main trend of conjugate variation of characteristics and to average the influence of random factors, it is necessary to equalize the values of time series, i.e. you need to replace broken lines with smooth, smoothly running lines.

One of the most effective approaches is the alignment of time series using the least squares method. The essence of the least squares method is to minimize the sum of square deviations between observed and calculated values. The calculated values are found using the selected equation - the regression equation. The smaller the distance between the actual values and the calculated ones, the more accurate the forecast based on the regression equation.

RESULTS

According to this method, from the infinite number of lines that could theoretically be drawn between the points depicting the original series, only one straight line is selected, which would have the smallest sum of squared deviations of the original points from this theoretical line:

$$\sum (x_i - \tilde{x})^2 = \min$$

Hence the name of the method – the "least squares" method.

The requirement of the least squares method is that the theoretical points $\tilde{y}_x$'must be obtained in such a way that the sum of the squared deviations from these points for the empirical observations y_i was minimal

$$Q = \sum (y_i - y_x)^2 = \sum (y_i - f(x))^2 = Q_{\min}$$

By calculating the minimum of this expression in accordance with the principles of mathematical analysis, transforming it, one can obtain a system of normal equations in which the unknown quantities are the required parameters of the regression equation, and the known coefficients are determined by the empirical values of the characteristics, usually the sums of their values and their cross derivatives.

The equation of a straight line or a parabola of the first order can be expressed in the form of deviations of the terms of the series from their averages:

$$\tilde{y}_x - \bar{y} = b_{yx}(x - \bar{x});\ \ \bar{x}_y - \bar{x} = b_{xy}(y - \bar{y})$$

If we move the averages $\bar{y}$ to $\bar{x}$ the right side of the equation, we get

$$\bar{y}_x = \bar{y} + b_{yx}(x_i - \bar{x});\quad \bar{x}_y = \bar{x} + b_{xy}(y_i - \bar{y})$$

System of normal equations for determining parameters *a* and *b* will be the following:

$$an + b\sum (x_i - \bar{x}) = \sum y$$

$$a\sum (x_i - \bar{x}) + b\sum (x_i - \bar{x})^2 = \sum y(x_i - \bar{x})$$

Since $\sum (x - \bar{x}) = 0$, the system of equations will take the following form:

$$an = \sum y;$$

$$b\sum (x_i - \bar{x})^2 = \sum y(x_i - \bar{x})$$

Hence, the parameters of the equation of a first order parabola (straight line), expressed in the form of deviations of the series members from their average values, turn out to be as follows:

$$a = \frac{\sum y}{n} = \bar{y} \qquad (1)$$

$$b = \frac{\sum y(x_i - \bar{x})}{\sum (x_i - \bar{x})^2} \qquad (2)$$

When aligning the time series, we used statistical data on IUGR of newborns among the population of Tashkent for 2006-2015. (Table 1).

In this case, the arithmetic mean for the independent variable is determined by time points indicated by numbers in the natural series:

$$\bar{x} = \frac{1+10}{2} = 5{,}5$$

Then we calculate the deviation of the terms of the series of the dependent variable *y* from this value (taking into account the signs) and perform the calculations shown in Table 1.

Table 1

Dynamics of the incidence of intestinal obstruction among children in Samarkand for 2015-2023

Year	x_i	Prevalence of IUGR, y_i	$(x_i - \bar{x})$	$y(x_i - \bar{x})$	$(x_i - \bar{x})^2$	$\bar{y}_x$
2015	1	16	-4.5	-3118.5	20.25	631.7
2016	2	19	-3.5	-2551.5	12.25	657.6
2017	3	23	-2.5	-2005	6.25	683.4
2018	4	22	-1.5	-1197	2.25	709.3
2019	5	20	-0.5	-396.5	0.25	735.2
2020	6	19	0.5	388.5	0.25	761.0
2021	7	25	1.5	1462.5	2.25	786.9
2022	8	44	2.5	1842.5	6.25	812.7
Σ			-	2133.5	82.5	

Substituting the found values into formulas (1) and (2), we determine the parameters of the linear equation:

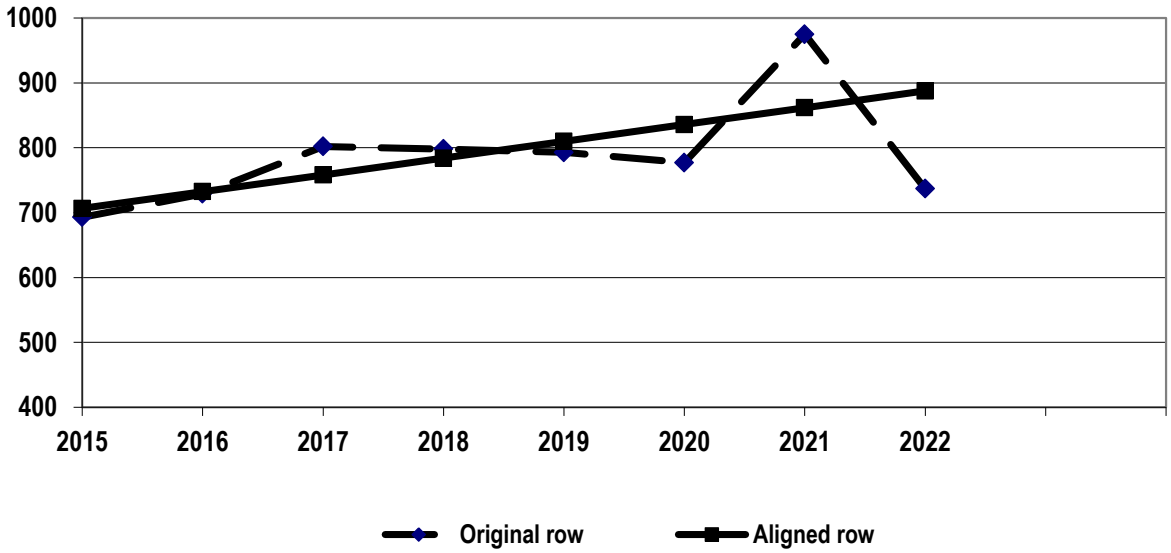
$$a = \frac{\sum y_i}{n} = \frac{822{,}9}{10} = 822{,}9$$

$$b = \frac{\sum y(x_i - \bar{x})}{\sum (x_i - \bar{x})^2} = \frac{-1981}{85} = -23{,}31$$

Hence, the formula for leveling the dynamics of IUGR in newborns and its prediction among the population of Tashkent has the following form:

$$\bar{y}_x = 822{,}9 + 25{,}86(x_i - \bar{x})$$

The values of the dependent variable calculated using this equation $\bar{y}_x$ are placed in the last column of Table 6.1. A more visual representation of this is given in Fig. 1, which shows a broken and calculated smoothly running line of this series.



Rice. 1. Raw and aligned propagation data
intestinal obstruction among children in Samarkand for 2015-2023

table 2

Calculation of time series indicators (absolute growth, growth rate, average growth rate, value of 1% growth) of Samarkand

Aligned row	Abs. growth	Growth rate, %	Average growth rate	ε, %
965	-	-		4.4
991	26.0	2.7		4.5
1017	26.0	2.6		4.6
1043	26.0	2.6	$T = \frac{b \cdot k}{a} = \frac{25{,}9 \cdot 2}{822{,}9} = 6{,}3\%$	4.7
1069	26.0	2.5		4.8
1095	26.0	2.4		4.9
1121	26.0	2.4		5.0
1147	26.0	2.3		5.1
1173	26.0	2.3		5.1
1198	25.0	2.1		5.2
ε_{avg}				4.8

The absolute increase characterizes the rate of change of the process (the absolute value of the increase per unit of time). The absolute increase is calculated as the difference between this level and the previous one; is indicated by a "+" sign, characterizing an increase, or a "-" sign, characterizing a decrease.

To characterize changes in the process of one period in relation to the previous period, an indicator such as the rate of growth (decrease) is used; is calculated as a percentage of the subsequent (level) to the previous one.

For a general quantitative assessment of trends in a time series, an indicator called the average rate of growth (decrease), expressed in %, is used. When calculating the tempo for most rows, you can use the following formula:

$$T_{пр.сн.} = \frac{b \cdot k}{a} \cdot 100$$

where k =1 for an odd number of levels of the series; k =2 for an even number of levels of the series; a and b are indicators of linear dependence used when aligning the series using the least squares method.

We calculate the average relative error using the formula:

$$\varepsilon = \frac{1}{n} \cdot \sum \left(\frac{\left[y_{ф} - y_{p} \right]}{y_{ф}} \right) \cdot 100$$

ε=4.8% - high forecast accuracy

of intestinal obstruction among children in Samarkand for 2015-2023 was leveled (Table 6.3).

The formula for equalizing the dynamics of the spread of equalizing the dynamics of the spread of intestinal obstruction among children in Samarkand and the Samarkand region for 2015-2023 is as follows:

$y_x = 822{,}9 + 25{,}9(x_i - \bar{x})$ Samarkand _

$y_x = 1119{,}6 - 15{,}1(x_i - \bar{x})$ Akdarinsky area

$y_x = 729{,}6 + 19{,}7(x_i - \bar{x})$ Bulungur district

$y_x = 734{,}1 + 35{,}6(x_i - \bar{x})$ Dzhambaisky district

$y_x = 695{,}8 + 20{,}6(x_i - \bar{x})$ Ishtykhansky district

$y_x = 726{,}9 + 31{,}0(x_i - \bar{x})$ Kattakurgan district

$y_x = 709{,}5 + 28{,}0(x_i - \bar{x})$ Koshrabad district

$y_x = 716{,}6 + 35{,}01(x_i - \bar{x})$ Narpai district

$y_x = 681{,}9 + 30{,}4(x_i - \bar{x})$ Nurabad district

Table 3

incidence rate of intestinal obstruction among children in Samarkand and the Samarkand region for 2023-2030

(abs.)

Regions	2015	2016	2017	2018	2019	2020	2021	2022
Samarkand	2	0	3	0	1	0	1	3
Akdarinsky area	1	2	2	4	0	3	0	1
Bulungursky	0	0	4	0	3	0	3	2
Jambaysky	2	3	0	3	0	4	0	2
Ishtykhansky	1	2	1	0	2	0	1	5
Kattakurgan	0	1	3	1	1	1	2	3
Koshrabadsky	2	2	0	3	2	0	4	4
Narpaisky	0	1	1	1	0	0	0	2
Nurabadsky	2	3	2	1	1	2	3	5
Payaryksky	2	1	0	2	4	0	2	2
Pastargomsky	0	2	2	0	1	4	4	3
Pakhtachiysky	1	1	0	2	2	0	0	2
Samarkand	2	0	2	4	0	3	2	3
Tailaksky	0	1	0	0	3	0	0	4
Urgutsky	1	0	3	1	0	2	3	3
Total	16	19	23	22	20	19	25	44

$y_x = 699{,}2 + 62{,}6(x_i - \bar{x})$ Payaryk district

$y_i = 673{,}4 + 31{,}6(x_i - \bar{x})$ Pastargomsky district

$y_i = 720{,}2 + 21{,}2(x_i - \bar{x})$ Pakhtachiysky district

$y_i = 728{,}4 + 44{,}5(x_i - \bar{x})$ Samarkand district

$y_i = 667{,}9 + 54{,}4{,}2(x_i - \bar{x})$ Tailaksky district

$y_i = 659{,}3 + 45{,}1(x_i - \bar{x})$ Urgut district

Prognostic assessments are based only on identified, characteristic of the period under study, manifestations of long-term dynamics of morbidity and do not take into account possible future atypical changes in the activity of risk factors.

Therefore, any method for calculating prognostic indicators of IUGR gives only an approximate (with varying degrees of accuracy) forecast.

Have you determined the average prognostic indicator and its possible maximum and minimum values (threshold indicators) in which the incidence rate of the next year may be, provided that there are no significant (force majeure or expected) changes in the activity of the causes of the occurrence and spread of any disease?, and/or significant changes in the completeness of detection, quality of diagnosis and recording of patients. If such changes occur, this will lead to atypical (in relation to the period studied) manifestations of morbidity and the morbidity rate for the next year may not correspond to the forecast.

DISCUSSION

Analysis of the results of forecasting indicators of intestinal obstruction among children showed that in the city of Samarkand of the republic there is a tendency to increase, for example, by 33.0% by 2030 compared to 2016, and in Akdarinsk region e, the incidence was wave-like; on the contrary, there was an increase of 5 times.

The resulting smooth line can be continued and a forecast for 2023-2030 can be given. (Table 4).

Table 4

Forecast of incidence rates of intestinal obstruction among children in Samarkand and the Samarkand region for 2023-2030 (abs.)

	2023	2024	2024	2025	2026	2027	2029	2030
Samarkand	3	2	3	2	1	3	2	4
Akdarinsky area	1	2	2	4	2	3	4	5
Bulungursky	1	3	4	1	3	2	3	2
Jambaysky	2	5	3	4	2	4	3	6
Ishtykhansky	2	3	4	2	2	3	2	5
Kattakurgan	0	1	3	1	1	1	2	3
Koshrabadsky	2	2	0	3	2	0	4	4
Narpaisky	2	1	3	1	4	2	3	3
Nurabadsky	3	5	4	2	3	2	5	6
Payaryksky	2	3	2	4	5	2	3	4
Pastargomsky	2	4	5	2	3	4	4	6
Pakhtachiysky	3	4	2	5	3	2	3	4

Samarkand	3	2	4	5	3	4	5	1
Tailaksky	0	1	0	0	1	0	1	2
Urgutsky	1	3	3	4	5	3	6	2

Forecasting the dynamics of the incidence of intestinal obstruction in children among the population of the regions for 2023-2030 shows that in other regions the incidence also maintains an increasing trend: in the Bulungur district - by 50.0%, in the Dzhambay district - by 30.0%, in the Ishtykhan district - by 30.0%, Kattakurgan region - 3 times, Koshrabad region - 2 times, Narpai region - 1.5 times, Nurabad district - 1.5 times, Payaryk district - 2 times; Pastargomsky district - 3 times: Pakhtachiysky district - 1.3 times, Samarkand region will decrease - 3 times; in the Tailak district will increase by 2 times.

Thus, the obtained result proves the validity of using the above-mentioned method for predicting the incidence of intestinal obstruction in children. And with the help of retrospective data and mathematical calculations, a forecast was made for the city of Samarkand and for the districts of the Samarkand region. Graphs were constructed that made it possible to further reveal some of the patterns inherent in predicting the incidence of intestinal obstruction in children and provide an opportunity for health authorities to develop treatment and preventive measures.

CONCLUSION

In areas where, according to forecasts, there will be an increase in the incidence of newborns, forecasting the incidence of intestinal obstruction in children, it is necessary to strengthen the interaction of medical and preventive institutions, sanitary and epidemiological services. The media and conversations with parents can play a major role in reducing the incidence of intestinal obstruction in children.

References:

1. Abdurakhmanov DS, Rakhmanov QE, Davlatov SS. Clinical questions extreme currents syndrome Mirizzi. Electronic Innovation Bulletin. 2021;(6):37-40.
2. Abdurakhmanov DS, Rakhmanov QE, Davlatov SS. Criteria for choosing surgical treatment of patients with ventral hernias and obesity. Electronic Innovation Bulletin. 2021;(7):57-67.
3. Abdurakhmanov DS, Rakhmanov QE, Davlatov SS. Tensioned hernioplasty and abdominoplasty in patients with morbid obesity. Electronic Innovation Bulletin. 2021;(3):20-27.

4. Ikhtiyarova GA, et al. Pathomorphological changes of the placenta in pregnant women infected with Coronavirus COVID-19. International Journal of Pharmaceutical Research (09752366). 2020;12(3).
5. Mavlyanov FS, et al. Laparoscopy in the complex treatment of severe acute pancreatitis. European Journal of Molecular & Clinical Medicine. 2020;7(02).
6. Mavlyanov FS, et al. Monitoring Of Organ Failure Development In Patients With Acute Pancreatitis. European Journal of Molecular & Clinical Medicine. 2020;7(3):2523-2528.
7. Oripov F, et al. Development Of Immune Structures Of The Leaning Intestine Of Rabbits In Early Postnatal Ontogenesis. International Journal of Pharmaceutical Research (09752366). 2021;13(1).
8. Sayinaev FK, et al. Modified method for laparoscopic hernioalloplasty in ventral hernias. British Medical Journal. 2023;3(3).
9. Shamsiev AM, Davlatov SS, Saydullaev ZY. Optimization of treatment of patients with postoperative ventral hernia. Science, technology and education. 2017;(10):94-99.
10. Shavkatovich MF, Khodzhamkulovich MS, Esankulovich TS. Clinical and statistical characteristics of children with congenital intestinal obstruction. Journal of biomedicine and practice. 2023;8(2).