Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

The State of the Intestinal Microflora and Assessment of the Health State among People with Impaired Glucose Tolerance

Sanjar Kholboyev
Samarkand State Medical Institute, lecture at the Department of General / Family Medicine, Candidate of Medical Sciences
kholboevsanjar2@mail.com
Khidoyat Rahimova
Samarkand State Medical Institute, lecture at the Department of General / Family Medicine
sanjarkh@mail.ru
Nilufar Sulaymanova
Samarkand State Medical Institute, lecture at the Department of General / Family Medicine
nilufar11131970@mail.ru

Abstract.*Diabetes mellitus is considered one of the most important medical and social problems of our time. One of the most promising areas in the fight against diabetes is primary and secondary prevention. With diabetes, the liver, stomach and intestines are affected. At the same time, it was shown that in patients with diabetes there is a violation of normal intestinal microbiocenosis. In turn, a violation of the intestinal microbiocenosis can cause pathological changes in various organs and reduce immunity.In this regard, early detection and correction of various risk factors for diabetes is of great importance.*
The aim of the study: *To study the state of the microflora of the large intestine and assess the state of health among persons with impaired glucose tolerance.*
Materials and research methods: We examined 16 patients with 2 types of diabetes, 32 patients with IGT and 50 people without DM and IGT. Persons with manifest diseases of the gastrointestinal tract were excluded from the examination. The medical examination included the following methods: questionnaire, biochemical, instrumental and microbiological. Along with the generally accepted methods of examining patients with gastrointestinal pathology (ultrasound of the liver, pancreas, X-ray, gastrofibroscopy, sigmoidoscopy and fecal analysis, etc.), their glycemic levels were also studied.
Research results*:According to these criteria, the incidence of normal glucose tolerance, IGT, and diabetes mellitus was 51.02%, 32.65% and 16.33%, respectively. When analyzing the frequency of normal glucose tolerance in the age groups of 30-39 years old, 40-49 years old and 50-60 years old, it was shown that it is 45.45%, 60.00% and 47.83%, respectively. The incidence ofIGTin the corresponding age groups was, respectively, 45.45%, 20.00% and 34.78%, and the frequency of diabetes mellitus in these groups was 9.09%, 20.00% and 17, respectively. 39%. In connection with the above, an analysis of the frequency of intestinal dysbiosis was carried out among persons who differ in their assessment of their health. Among people who do not see a doctor, the incidence of intestinal dysbiosis is 100%. Among those who turn to doctors only when they feel very unwell, the frequency of intestinal dysbiosis is slightly less (82.93%), and less often (66.67%) intestinal dysbiosis occurs among those patients who always turn to doctors when they worsen. well-being. These data indicate the important role of timely referral of patients to doctors. At the same time, these data indicate that even a timely visit to doctors does not always give the desired effect, because patients, as a rule, turn to a doctor with other complaints and other pathologies.*
Conclusions:*The data of the present study make it possible to supplement the risk groups of intestinal dysbiosis with persons with impaired glucose tolerance. Impaired glucose tolerance is a risk factor for intestinal dysbiosis. Intestinal dysbiosis is associated with a violation of both the sympathoadrenal phase of the glycemic curve and the vagoinsular phase. The results of the study allow to optimize the treatment tactics in patients with dysbiosis with insulin resistance. The results of this study can be used in*

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

preventive programs for the prevention of intestinal dysbiosis in persons with impaired glucose tolerance.

Keywords:*diabetes mellitus, the state of intestinal microflora, impaired glucose tolerance, assessment of the state of one's health.*

Relevance: Diabetes mellitus (DM) is a disease in which all organs and systems of the body are affected. Despite the great efforts aimed at improving the methods of treating diabetes, the morbidity and mortality from this disease continue to grow. In this regard, diabetes is considered one of the most important medical and social problems of our time. A number of studies have shown that diabetes is accompanied by damage to the liver, stomach and intestines [1,2]. It has been shown that in patients with diabetes, there is a violation of the normal intestinal microbiocenosis [3]. In turn, violation of intestinal microbiocenosis can cause pathological changes in various organs and reduce immunity [4,5,6]. A number of studies have shown a relationship between the violation of intestinal microflora and diabetes mellitus [7,8]. One of the most promising areas in the fight against diabetes is primary and secondary prevention. In this regard, early detection and correction of various risk factors for diabetes is of great importance. On the other hand, given the important role of diabetes mellitus in the formation of a number of internal diseases, timely correction of carbohydrate metabolism disorders is of great importance in their prevention and treatment.

The aim of the study: To study the state of the microflora of the large intestine and assess the state of their health among persons with impaired glucose tolerance.

Materials and research methods: We examined 16 patients with type 2 diabetes, 32 patients with IGT and 50 people without DM and IGT. Persons with manifest diseases of the gastrointestinal tract were excluded from the examination. The medical examination included the following methods: questionnaire, biochemical, instrumental and microbiological. Along with the generally accepted methods of examining patients with gastrointestinal tract pathology (ultrasound of the liver, pancreas, X-ray, gastro-fibroscopy, sigmoidoscopy and fecal analysis, etc.), they also studied the glycemic levels.

Research results.

Proceeding from the fact that the purpose of this study was to study the relationship between NTG, as well as the violation of various phases of the glycemic curve with intestinal dysbiosis, groups with normal and impaired glucose tolerance were analyzed. For this, in order to achieve comparability of the studied groups, 50 people with normal glucose tolerance and 48 people with hyperglycemia (IGT - 32 people and diabetes mellitus - 16 people) were selected. At the same time, the frequency of IGT and diabetes mellitus was first studied according to the WHO criteria

(Table 1).

The incidence of IGT in different age groups according to WHO criteria.

	Number of observations			
Age	Norm	IGT	DM	Overall
30-39 y.o	10	10	2	22
40-49 y.o	18	6	6	30
50-60 y.o	22	16	8	46
Overall	50	32	16	98
	In Percantage			
Age	Norm	IGT	DM	Overall

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

30-39 y.o	45,45	45,45	9,09	100,00
40-49 y.o	60,00	20,00	20,00 *	100,00
50-60 y.o	47,83	34,78	17,39 *	100,00
Overall	51,02	32,65	16,33	100,00

Note: the table shows the reliability of the differences in indicators relative to the age group 30-39 years

According to these criteria, the incidence of normal glucose tolerance, IGT, and diabetes mellitus was 51.02%, 32.65% and 16.33%, respectively. When analyzing the frequency of normal glucose tolerance in the age groups of 30-39 years old, 40-49 years old and 50-60 years old, it was shown that it is 45.45%, 60.00% and 47.83%, respectively. The incidence of IGT in the respective age groups was, respectively, 45.45%, 20.00% and 34.78%, and the incidence of diabetes mellitus in these groups was, respectively, 9.09%, 20.00% and 17.39%. The presented data do not claim to indicate the frequency of IGT in the population. They only characterize the contingent selected to study the relationship between IGTand intestinal dysbiosis. Considering that it is of interest not only the relationship of intestinal dysbiosis with IGT, but also with violations of various phases of the glycemic curve, further analyzed the frequency of violations of various phases of the glycemic curve among the surveyed group.

(Table 2).The frequency of violations of various phases of the glycemic curve.

	Number of observations			
Hyperglycemia	30-39 y.o	40-49 y.o	50-60 y.o	Overall
Norm	10	18	22	50
On an empty stomach	6	2	2	10
After an hour	-	2	4	6
After 2hours	-	2	6	8
After 1 or 2 hours	4		4	8
Diabetes	2	6	8	16
Overall	22	30	46	98
	In %			
Hyperglycemia	30-39 y.o	40-49 y.o	50-60 y.o	Overall
Norm	45,45	60,00	47,83	51,02
On an empty stomach	27,27	6,67 *	4,35 *	10,20
After an hour	0,00	6,67	8,70	6,12
After 2hours	0,00	6,67	13,04	8,16
After 1 or 2 hours	18,18	0,00	8,70 *	8,16
Diabetes	9,09	20,00 *	17,39 *	16,33
Overall	100,00	100,00	100,00	100,00

Note: the table shows the reliability of the differences in indicators relative to the age group 30-39 years

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

According to the data obtained, fasting hyperglycemia is most common among persons aged 30-39 years and in general is 10.2%. Hyperglycemia 1 hour after glucose load, 2 hours later, and a combination of hyperglycemia 1 and 2 hours after glucose load occur in the population with approximately the same frequency. Further, the relationship of intestinal dysbiosis with the age of the examined patients was studied. It turned out (Table 3) that among the examined patients, more than half (81.63%) suffer from intestinal dysbiosis. These data should not be extrapolated to the entire population, since they characterize only the surveyed group.

Table 3. The frequency of intestinal dysbiosis in different age groups.

	Number of observations		
Age	Dysbiosis Yes	Dysbiosis No	Overall
30-39 y.o	14	8	22
40-49 y.o	28	2	30
50-60 y.o	38	8	46
Overall	80	18	98
	In %		
Age	Dysbiosis Yes	Dysbiosis No	Overall
30-39 y.o	63,64	36,36	100,00
40-49 y.o	93,33 *	6,67	100,00
50-60 y.o	82,61 *	17,39	100,00
Overall	81,63	18,37	100,00

Note: the table shows the reliability of the differences in indicators relative to the age group 30-39 years

Nevertheless, it should be noted that most often intestinal dysbiosis occurs at the age of 40-49 years. At the age of 50-60 years, intestinal dysbiosis occurs somewhat less frequently than among 40-49 year old patients, but more often than among patients 30-39 years old. Note that the differences in the incidence of intestinal dysbiosis in the age groups of 40-49 and 50-60 years did not have statistically significant differences. In order to deepen the study of this issue, the frequency of various degrees of intestinal dysbiosis was considered (Table 4). It turned out that among the examined patients the frequency of intestinal dysbiosis of 1 and 2 degrees prevails. No regularities in the frequency of intestinal dysbiosis with age were found. This picture can be explained by the fact that the selection of patients for this study was carried out on the basis of the presence of IGT, as the starting point of scientific research, because it was necessary to study the relationship between NTG and intestinal dysbiosis.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

Table 4.

	Number of observations				
Age	Dysbiosis 0	Dysbiosis 1	Dysbiosis 2	Dysbiosis 3	Overall
30-39 y.o	8	2	12	-	22
40-49 y.o	2	10	16	2	30
50-60 y.o	8	14	22	2	46
Overall	18	26	50	4	98
	In %				
Age	Dysbiosis 0	Dysbiosis 1	Dysbiosis 2	Dysbiosis 3	Overall
30-39 y.o	36,36	9,09	54,55	0,00	100,00
40-49 y.o	6,67 *	33,33 *	53,33	6,67	100,00
50-60 y.o	17,39	30,43 *	47,83	4,35	100,00
Overall	18,37	26,53	51,02	4,08	100,00

Note: the table shows the reliability of the differences in indicators relative to the age group 30-39 years

At present, a sufficiently large number of scientific facts have been accumulated indicating that a number of risk factors are involved in the development and progression of various diseases, as well as mortality from them. Modern concepts of improving the population provide for the active participation of patients in the treatment and prophylactic process. The effectiveness of therapeutic and prophylactic measures is significantly influenced by the psychological state and personality traits. Along with the important role of timely and adequate detection of various diseases and pathological conditions by doctors of health care facilities, the adequacy of patients' assessment of their health is of particular importance. Adequate assessment by the patient of his health is an important aid to timely access to a doctor and the implementation of treatment and preventive measures. Therefore, a very relevant and important aspect is the study of the attitude of patients to their health, the appeal to doctors and the implementation of medical recommendations. In connection with the above, an analysis of the frequency of intestinal dysbiosis was carried out among persons differing in their assessment of their health. The data obtained show that among people who do not go to doctors, the frequency of intestinal dysbiosis is 100%. Among those who turn to doctors only when they feel very unwell, the frequency of intestinal dysbiosis is slightly less (82.93%), and less often (66.67%) intestinal dysbiosis occurs among those patients who always turn to doctors when their health worsens. These data indicate the important role of timely patients' referral to doctors. At the same time, this information indicates that even a timely visit to doctors does not always give the desired effect, because patients, as a rule, turn to a doctor with other complaints and other pathologies. Further, the degree of intestinal dysbiosis was studied among patients with different visits to doctors. It has been shown that there are no definite regularities between the degree of intestinal dysbiosis and the number of visits to doctors. At the same time, it turned out that the 2nd degree of intestinal dysbiosis is most often found among those who ignore going to the doctor, as well as among those who go to the doctor only with very poor self-feeling. Along with the patients' appeal to doctors, the assessment of the state of their health was also studied. According to the data obtained (Fig. 3), intestinal dysbiosis is most often found among patients who consider themselves healthy (87.5%). Among those

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

who assess their health as "satisfactory", the frequency of dysbiosis was slightly lower (85.29%), and the least (57.14%) intestinal dysbiosis occurred among patients who considered their state of health "unsatisfactory." It should be admitted that some unexpected data were obtained, because it turns out that with good health there is a higher risk of developing intestinal dysbiosis. This conclusion is contrary to elementary logic. Therefore, in order to clarify this issue, the frequency of degrees of intestinal dysbiosis was considered with different assessments of the state of one's own health (Fig. 4). The data obtained suggest that patients were informed about the possibility of gastrointestinal diseases. To study this issue, we considered the diagnoses that were made by the doctors of health care facilities when patients referred to them. The data obtained is puzzling. It turns out that more than half of the examined persons have been reported by doctors in different years about the presence of intestinal diseases! At the same time, the analysis of medical records showed that these diagnoses were not verified. The conclusion about bowel disease was made empirically or by the presence of certain clinical symptoms characteristic of dysbiosis. Moreover, after the diagnosis was established, these patients received virtually no treatment. To assess the significance of NTG in the development of dysbiosis in a comparative aspect, the frequency of intestinal dysbiosis with normal glucose tolerance, IGT and diabetes mellitus was studied. According to the data obtained, the frequency of intestinal dysbiosis with normal glucose tolerance occurs somewhat more often than with IGT and somewhat less often than with diabetes mellitus. However, the revealed differences turned out to be statistically significant only in relation to diabetes mellitus.

Table 5. The incidence of intestinal dysbiosis in IGT and diabetes mellitus.

	Number of observations		
Hyperglycemia	Dysbiosis Yes	Dysbiosis No	Overall
Norm	28	22	50
NTG	24	8	32
SD	14	2	16
Overall	66	32	98
	In %		
Hyperglycemia	Dysbiosis Yes	Dysbiosis No	Overall
Norm	56,00	44,00	100,00
NTG	75,00	25,00	100,00
SD	87,50 *	12,50 *	100,00
Overall	67,35	32,65	100,00

Note: the table shows the reliability of the differences in indicators relative to the group with normal glucose tolerance.

In order to deepen the analysis of the study of the role of IGT in the formation of intestinal dysbacteriosis, the frequency of various forms of intestinal dysbiosis with IGT was considered (Table 6). It turned out that the 1st degree of intestinal dysbacteriosis is most common in diabetes mellitus. The 2nd degree of intestinal dysbiosis occurs with IGT more often than with normal glucose tolerance. The data obtained does not quite correspond to the logic. The question remains not entirely clear why, with normal glucose

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

tolerance, the frequency of grade 1 intestinal dysbiosis with normal glucose tolerance is higher, and the frequency of grade 2 intestinal dysbiosis is lower than with IGT.

Table 6.
The incidence of various degrees of intestinal dysbiosis with IGT and diabetes mellitus.

	Number of observations				
Hyperglycemia	Dysbiosis 0	Dysbiosis 1	Dysbiosis 2	Dysbiosis 3	Overall
Norm	22	16	11	1	50
IGT	5	7	19	1	32
DM		5	9	2	16
Overall	27	28	39	4	98
	In %				
Hyperglycemia	Dysbiosis 0	Dysbiosis 1	Dysbiosis 2	Dysbiosis 3	Overall
Norm	44,00	32,00	22,00	2,00	100,00
IGT	15,63	21,88	59,38	3,13	100,00
DM	0,00	31,25	56,25 *	12,50 *	100,00
Overall	27,55	28,57	39,80	4,08	100,00

Note: the table shows the reliability of the differences in indicators relative to the group with normal glucose tolerance.

It is pertinent to recall here that the main purpose of this study was to study the role of disturbances in various phases of the glycemic curve on the frequency of intestinal dysbiosis. In this regard, the frequency of intestinal dysbiosis was studied in violation of the sympathoadrenal and vagoinsular phases of the glycemic curve (Table 7). From the data obtained, it follows that with IGT 1 hour after glucose load, also with diabetes mellitus, the frequency of intestinal dysbiosis is higher than with fasting glycemia and glycemia 2 hours after glucose load. The lowest incidence of intestinal dysbiosis was observed in patients with hypglycemia 1 and 2 hours after glucose loading. These data cannot fully shed light on the question of whether the disturbances in the sympathoadrenal phase of the glycemic curve and the vagoinsular phase of the glycemic curve have a role in the formation of intestinal dysbiosis.

Table 7.
The incidence of intestinal dysbiosis in various categories ofIGTand diabetes mellitus.

	Number of observations		
Hyperglycemia	Dysbiosis Yes	Dysbiosis No	Overall
Norm	28	22	50
On an empty stomach	8	2	10
After an hour	6		6
After 2 hours	6	2	8

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

After 1 or 2 hours	4	4	8
Diabetes	14	2	16
Overall	66	32	98
	In %		
Hyperglycemia	Dysbiosis Yes	Dysbiosis No	Overall
Norm	56,00	44,00	100,00
On an empty stomach	80,00 *	20,00	100,00
After an hour	100,00 *	0,00	100,00
After 2 hours	75,00	25,00	100,00
After 1 or 2 hours	50,00	50,00	100,00
Diabetes	87,50 *	12,50	100,00
Overall	67,35	32,65	100,00

Note: the table shows the reliability of the differences in indicators relative to the group with normal glucose tolerance.

Therefore, further analyzed the frequency of various degrees of dysbiosis in violation of various phases of the glycemic curve (Table 8). The data presented in table 8 somewhat clarified the question of the significance of the violation of various phases of the glycemic curve on the development of intestinal dysbiosis. It was shown that with hyperglycemia 1 hour after glucose loading, the frequency of dysbiosis of 1 and 2 degrees is higher than with normal glucose tolerance. The incidence of grade 2 dysbiosis is more likely to occur with hyperglycemia 2 hours after glucose loading than with normal glucose tolerance. The highest frequency of grade 1 dysbiosis occurs in patients with diabetes mellitus. Of particular interest is the fact that grade 3 dysbiosis occurred only with normal glucose tolerance.

Table 8.The incidence of various degrees of intestinal dysbiosis in certain categories ofIGTand diabetes mellitus.

	Number of observations				
Hyperglycemia	Dysbiosis 0	Dysbiosis 1	Dysbiosis 2	Dysbiosis 3	Overall
Norm	22	16	11	1	50
On an empty stomach	2	2	5	1	10
After an hour	1	2	3		6
After 2 hours	1	2	5		8
After 1 or 2 hours	1	1	6		8
Diabetes		5	9	2	16
Overall	27	28	39	4	98
	In %				

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

Hyperglycemia	ysbiosis **0**	ysbiosis **1**	ysbiosis **2**	ysbiosis **3**	**Overall**
Norm	44,00	32,00	22,00	2,00	100,00
On an empty stomach	20,00	20,00	50,00 *	10,00	100,00
After an hour	16,67	33,33	50,00 *	0,00	100,00
After 2 hours	12,50	25,00	62,50	0,00	100,00
After 1 or 2 hours	12,50 *	12,50	75,00 *	0,00	100,00
Diabetes	0,00	31,25	56,25 *	12,50 *	100,00
Overall	27,55	28,57	39,80	4,08	100,00

Thus, the data obtained can only indirectly indicate that violations of the sympathoadrenal phase of the glycemic curve and violations of the vagoinsular phase of the glycemic curve have some connection with intestinal dysbiosis. However, these data are not enough to reliably judge the role of disturbances in various phases of the glycemic curve on intestinal dysbiosis. In order to further study the relationship between hyperglycemia and intestinal dysbiosis, the mean levels of fasting glycemia were studied, 1 and 2 hours after glucose loading in patients with intestinal dysbiosis (Fig. 6). According to the data obtained, the average fasting blood glucose values were slightly higher with intestinal dysbiosis than with normal intestinal microflora. At the same time, the average glycemic values after 1 and 2 hours after glucose load were slightly higher in persons without intestinal dysbiosis than in those with intestinal dysbiosis. To clarify the question of the relationship between average levels of glycemia and intestinal dysbiosis, we studied the glycemic parameters at various degrees of intestinal dysbiosis (Fig. 7). According to the data obtained, the highest levels of fasting glycemia occurred in grade 1 dysbiosis, the highest glycemic levels 1 hour after glucose loading - in grade 2 dysbiosis, and the highest glycemic levels 2 hours after exercise were observed in individuals without intestinal dysbiosis. As can be seen from the above data, the question of the role of the violation of various phases of the glycemic curve has not been resolved. Therefore, the scientific search was continued in a slightly different direction. The data of the present study indicate the ambiguity of the combined disorders of the 1st and 2nd phases of the glycemic curve in relation to intestinal dysbiosis. All this prompted us to deepen our research in order to study the relationship between intestinal dysbiosis and the indicators of the glycemic curve. Proceeding from the fact that the level of glycemia 1 hour after glucose loading characterizes the sympathoadrenal activity of the body, manifested in the transformation of glycogen into glucose, as well as in the process of absorption of glucose in the gastrointestinal tract, and glycemia after 2 hours reflects the vagoinsular activity, i.e. the ability of the body to utilize glucose entering the blood, an attempt was made to study the informative significance of various coefficients reflecting the ratio of the sympathoadrenal and vagoinsular phases of the glycemic curve. For the hyperglycemic coefficient, the ratio was taken: glycemia 1 hour after glucose load / fasting glycemia. The glycemic coefficient was taken as the ratio: fasting glycemia / glycemia 2 hours after glucose load. The postglycemic coefficient was taken as the ratio: glycemic level 1 hour after glucose load / glycemic level 2 hours after glucose load. Thus, values are obtained that reflect the ratio of sympathoadrenal and vagoinsular activity of the body. Ultimately, these coefficients reflect the state of carbohydrate metabolism in the body. According to the data obtained (Fig. 8), no significant links were found between the levels of the hyperglycemic coefficient and the degree of dysbiosis. At the same time, the value of the glycemic coefficient gradually increases with the appearance and increase in the degree of intestinal dysbiosis. The value of the postglycemic coefficient

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

also increases as the degree of dysbiosis increases. It should be noted that the value of the postglycemic coefficient in the second degree of dysbiosis is slightly lower than in the first degree. However, the revealed differences were not statistically significant. Thus, we can conclude that the rapid utilization of glucose, which is indicated by the glycemic coefficient, can serve as a marker that suggests that the patient has a tendency to intestinal dysbiosis. At the same time, a rapid decrease in the level of glycemia after its rise (postglycemic coefficient) may also indicate an increased activity of the vagoinsular phase of the glycemic curve. An increase in this indicator can also serve as a predictor of intestinal dysbiosis. Currently, the study of the role of insulin resistance in the formation and course of diseases of the gastrointestinal tract is of great interest. This is due to the fact that insulin resistance, along with diabetes, also includes impaired glucose tolerance (IGT) in the form of a violation of the vagoinsular phase of the glycemic curve. In clinical practice, the violation of the vagoinsular phase of the glycemic curve is defined as IGT 2 hours after glucose loading. It should be noted that a violation of the vagoinsular phase of the glycemic curve may, in some cases, precede the development of manifest diabetes. Therefore, the study of the state of intestinal microbiocenosis during IGT is of certain interest. According to the data obtained (Table 9), the content of bifidobacteria in patients with diabetes and among those with IGT was significantly lower than among those with normal glycemic levels. In individuals with IGT and patients with DM, the content of lactobacilli was lower than among those surveyed with normal glucose levels. However, statistically significant differences were noted only in relation to groups with normal glucose tolerance and diabetes mellitus. Also shown is a higher content of enterococci with normal glucose tolerance than among individuals with IGT and patients with diabetes. Note that these differences were not significant. There were no significant differences in the content of enterococci in the groups under consideration. It should be noted that in the groups with IGT and DM, the content of enterococci was slightly higher than in the case of normal glucose tolerance. Despite a slightly lower content of clostridia in individuals with normal glycemic levels than among individuals with IGT and diabetes patients, no statistically significant differences were found between these parameters. The number of typical E. coli among persons with normal glucose tolerance was higher, and lactose-negative E. coli was lower than among patients with diabetes and those with IGT. However, significant differences were found only between the groups with normoglycemia and diabetes. The content of peptostreptococci with normoglycemia was significantly higher than with IGT and DM. The number of fungi of the genus Candida, staphylococci, saprophytic, epidermal and other enterobacteria in patients with diabetes and individuals with IGT was higher than in individuals with normal glucose tolerance. At the same time, statistically significant differences in all studied parameters took place in relation to other enterobacteria and fungi of the genus Candida. At the same time, the differences in the content of saprophytic and epidermal staphylococci in the groups with normoglycemia and IGT did not have significant differences.

Table 9. The state of the microflora of the large intestine in healthy people, persons with IGT and diabetes mellitus (in Lg KOE / gr)

Microorganisms	Normal glucose tolerance	**People with NTG**	nts with SD
bacteria	9,9±1,1	8,0±0,7 *	,5±0,9 *
bacteria	7,1±0,4	6,2±0,3	,9±0,3 *
ococci	6,2±0,5	5,7±0,2	±0,1

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

streptococci	8,8±0,6	7,4±0,3 *	,1±0,4 *
idia	5,0±0,4	5,3±0,2	3±0,6
typical	7,9±0,3	7,1±0,2	,1±0,1 *
lactose-negative	4,5±0,3	5,2±0,3	,8±0,5 *
r enterobacteria	3,7±0,5	6,6±0,2 *	,7±1,2 **
Staphylococcus saprophytic, epidermal	3,8±0,4	4,3±0,2	,2±0,8 *
Yeast-like mushrooms of the genus Candida	3,7±0,3	4,8±0,3 *	,9±0,5 *

Note: the table shows the reliability of the difference in indicators in the groups with IGT and DM relative to the group of people with a normal glycemic level.

The data obtained give strong grounds to believe that even at the stages of latent hyglycemia, dysbiosis of the large intestine takes place. On the basis of a one-step study, it is difficult to judge the primary nature of the pathological process, i.e. what was primary - dysbiosis or impaired glucose tolerance. This question can be answered with long-term prospective observation. The aim of this work was to study the microflora of the large intestine with impaired glucose tolerance. The work shows that dysbiotic processes are less pronounced among individuals with IGT than in overt diabetes mellitus. However, significant differences were found between the quantitative content of individual representatives of the intestinal flora and impaired glucose tolerance. This information opens up new prospects for further study of intestinal diseases occurring in combination with IGT. The data suggest that IGT is a precursor to diabetes mellitus. Therefore, given the widespread prevalence of IGT, it is possible, to a certain extent, to explain the increase in the incidence of diabetes mellitus. Proceeding from this, as well as from the above data, it seems appropriate to conduct an examination for the detection of intestinal dysbiosis in persons with IGT, and to conduct an active detection of IGT among persons with impaired intestinal microbiocenosis. The results obtained allow us to conclude that among patients with diabetes mellitus there is a significant deterioration in intestinal microbiocenosis. In diabetes mellitus, there is a decrease in indigenous and an increase in facultative flora. At the same time, with IGT, there is an increased risk of the formation of dysbiotic processes in the intestine. The presence of NTG is associated with an increase in the content of indigenous flora with a decrease in the number of facultative microorganisms. Based on the results obtained, it seems appropriate to carry out early detection of violations of colon microbiocenosis in IGT and diabetes mellitus, followed by adequate correction of dysbiotic processes. In order to study the relationship between the content of various microorganisms and the levels of glycemia, their correlations were studied (Table 10). As the obtained data show, there are ambiguous connections between the indigenous and facultative flora on the one hand and the levels of glycemia.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

Table 10. Correlation coefficients between the content of microorganisms bowel and blood glucose levels

Microorganisms	Glycemia fasting	Glycemia after an hour	Glycemia after 2 hours
Bifidobacteria	0,045	0,134	0,101
Lactobacteria	0,056	0,179	0,134
Enterococci	- 0,431*	- 0,167	- 0,221
Peptostreptococci	- 0,034	- 0,275	- 0,306*
Clostridia	0,089	0,091	0,105
typical	0,234	0,268	0,243
lactose-negative	0,092	- 0,064	- 0,007
enterobacteria	- 0,213	- 0,143	- 0,57
Staphylococcus saprophytic, epidermal	0,092	- 0,261	- 0,329*
Yeast-like mushrooms of the genu Candida	- 0,26	- 0,284*	- 0,383*

The levels of the content of peptostreptococci, other enterobacteria, saprofit staphylococci and Candida fungi have inverse correlations with the levels of glycemia. At the same time, reliable links were noted between fasting glycemia and enterococci, glycemia after 2 hours and fungi of the genus Candida, as well as glycemia after 2 hours and peptostreptococci, saprophytic staphylococci and fungi of the genus Candida. Positive, but not significant, associations were noted between glycemic levels on the one hand and bifidobacteria, lactobacilli, clostridia and typical E. coli on the other hand.

Conclusions:

Impaired glucose tolerance is a risk factor for intestinal dysbiosis. The data of the present study make it possible to supplement the risk groups for intestinal dysbiosis with persons with impaired glucose tolerance. Intestinal dysbiosis is associated with a violation of both the sympathoadrenal phase of the glycemic curve and the vagoinsular phase. The results of the study make it possible to optimize treatment tactics in patients with dysbiosis with insulin resistance. The results of this study can be used in prophylactic programs for the prevention of intestinal dysbiosis in persons with impaired glucose tolerance.

References:

[1] Сахарныйдиабет. 2019;22(3):253-262 doi:10.14341/DM10194 Diabetes Mellitus. 2019;22(3):253-262

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 163 - 176
Received 15 December 2020; Accepted 05 January 2021.

[2] Кравчук Е.Н., Неймарк А.Е., Гринева Е.Н., Галагудза М.М. Регуляция метаболических процессов, опосредованная кишечной микрофлорой // *Сахарный диабет.* — 2016. — Т. 19. — №4: — С. 280-285. [Kravchuk EN, Neymark AE, Grineva EN, Galagudza MM.
[3] Lv Y, Zhao X, Guo W, et al. The Relationship between Frequently Used Glucose-Lowering Agents and Microbiota in Type 2 Diabetes Mellitus. *J Diabetes Res.* 2018;
[4] The role of microbiota in metabolic regulation. *Diabetesmellitus.*2016;19(4):280-285. (InRuss.)]
[5] Плотникова Е.Ю., Краснов О.А. Метаболический синдром и кишечная микрофлора; что общего? // *Экспериментальная и клиническая гастроэнтерология.* — 2015. — Т. 112. — №12. — С. 64-73. [Plotnikova EY, Krasnov OA. Metabolic syndrome and intestinal microfl ora: what overall? *Eksp Klin Gastroenterol.* 2015;112(12):64-73. (In Russ.)]
[6] Dahiya DK, Renuka, Puniya M, et al. Gut Microbiota Modulation and Its Relationship with Obesity Using Prebiotic Fibers and Probiotics: A Review. *Front Microbiol.* 2017;8:563.
[7] Woting A, Blaut M. The Intestinal Microbiota in Metabolic Disease.*Nutrients.*2016;8(4):202.
[8] Kuznetsova EE, Gorokhova VG, Bogorodskaya SL. The microbiota of intestine. The role in development of various pathologies. *Klinicheskaya Laboratornaya Diagnostika.* 2016;61(10):723-726
[9] ДедовИ.И., ШестаковаМ.В., МайоровА.Ю., идр. Алгоритмы специализированной медицинской помощи больным сахарным диабетом. / Под ред. Дедова И.И., Шестаковой М.В., Майорова А.Ю. — 8-й выпуск // *Сахарный диабет*. — 2017. — Т. 20. — №1S. — С. 1-121. [Dedov II, Shestakova MV, Mayorov AY, et al. Dedov II, Shestakova MV, Mayorov AY, editors. Standards of specialized diabetes care. 8th ed. *Diabetes mellitus.* 2017;20(1S):1-121. (InRuss.)]
[10] Ивашкин В.Т., Ивашкин К.В. Микробиом человека в приложении к клинической практике // *Российский журнал гастроэнтерологии, гепатологии, колопроктологии.* — 2017. — Т. 27. — № 6. — С. 4-13. [Ivashkin VT, Ivashkin KV. Human microbiome, applied to clinical practice. *Russian journal of gastroenterology,hepatology, coloproctology*. 2017;27(6):4-13. (In Russ.)]
[11] БорщевЮ.Ю., ЕрмоленкоЕ.И. Метаболическийсиндромимикроэкологиякишечника // *Трансляционнаямедицина*. — 2014. — № 1. — С. 19-28. [Borshchev YY, Ermolenko EI. Metabolic syndrome and intestinal microecology. *Translational medicine*. 2014;(1):19-28. (In Russ.)]
[12] Кожевников А.А., Раскина К.В., Мартынова Е.Ю., и др. Кишечная микробиота: современные представления о видовом составе, функциях и методах исследования // *РМЖ.* — 2017. — Т. 25. — №17. — С. 1244-1247. [Kozhevnikov AA, Raskina KV, Martynova EY, et al. Kishechnaya mikrobiota: sovremennye predstavleniya o vidovom sostave, funktsiyakh i metodakh issledovaniya. *RMZh.* 2017;25(17):1244-1247. (In Russ.)]
[13] Драпкина О.М., Корнеева О.Н. Кишечная микробиота и ожирение. Патогенетические взаимосвязи и пути нормализации кишечной микрофлоры // *Терапевтический архив.* — 2016. — Т. 88. — №9. — С. 135-142. [Drapkina OM, Korneeva ON. Microbiota and obesity: Pathogenetic relationships and ways to normalize the intestinal
microflora. *Ter Arkh.* 2016;88(9):135-142. (In Russ.)]
[14] ЧаплинА.В., РебриковД.В., БолдыреваМ.Н. Микробиомчеловека // *ВестникРГМУ*. — 2017. — №2. — С. 5-13. [Chaplin AV, Rebrikov DV, Boldyreva MN. The human microbiome. *Bulletin of RSMU*. 2017;(2):5-13. (InRuss.)]
[15] Щербакова М.Ю., Власова А.В., Роживанова Т.А. Роль микробиоты кишечника в развитии ожирения в возрастном аспекте // *Экспериментальная и клиническая гастроэнтерология.* — 2015. — №2. — С. 11-16. [Shcherbakova MY, Vlasova AV, Rozhivanova TA. The role of the intestine microbiota in the development of obesity. *Eksp Klin Gastroenterol.* 2015;114(2):11-16. (In Russ.)]
[16] Ilhan ZE, DiBaise JK, Isern NG, et al. Distinctive microbiomes and metabolites linked with weight loss after gastric bypass, but not gastric banding. *ISME J.* 2017;11(9):2047-2058.
[17] Clarke G, Stilling RM, Kennedy PJ, et al. Minireview: Gut microbiota: the neglected endocrine organ. *Mol Endocrinol.* 2014;28(8):1221-1238.
[18] Erejuwa OO, Sulaiman SA, Ab Wahab MS. Modulation of gut microbiota in the management of metabolic disorders: the prospects and challenges. *Int J Mol Sci.* 2014;15(3):4158-4188.
[19] Bazarova D. Some problems of counteracting crimes related to laundering of illegal proceeds in Uzbekistan Journal of Advanced Research in Dynamical and Control Systems. Volume 11, Issue 7, 2019, Pages 873-885

[20] Ismailova, Z., Choriev, R., Ibragimova, G., Abdurakhmanova, S., & Abdiev, N. (2020). Competent model of Practice-oriented education of students of the construction profile. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.04.85
[21] Ismailova, Z., Choriev, R., Musurmanova, A., & Aripjanova, M. (2020). Methods of training of teachers of university on advanced training courses. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.05.85
[22] Ismailova, Z., Choriev, R., Salomova, R., & Jumanazarova, Z. (2020). Use of economic and geographical methods of agricultural development. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.05.84
[23] Isakov, A., Tukhtamishev, B., & Choriev, R. (2020). Method for calculating and evaluating the total energy capacity of cotton fiber. IOP Conference Series: Earth and Environmental Science, 614(1), 012006
[24] Davirov, A., Tursunov, O., Kodirov, D., Baratov, D., & Tursunov, A. (2020). Criteria for the existence of established modes of power systems. IOP Conference Series: Earth and Environmental Science, 2020, 614(1), 012039
[25] Obidov, B., Choriev, R., Vokhidov, O., & Rajabov, M. (2020). Experimental studies of horizontal flow effects in the presence of cavitation on erosion-free dampers. IOP Conference Series: Materials Science and Engineering, 883(1), 012051
[26] Khasanov, B., Choriev, R., Vatin, N., & Mirzaev, T. (2020). The extraction of the water-air phase through a single filtration hole. IOP Conference Series: Materials Science and Engineering, 2020, 883(1), 012206
[27] Shokhrud F. Fayziev The problem of social stigma during a pandemic caused by COVID-19 International Journal of Advanced Science and Technology Vol. 29, No. 7, (2020), pp. 660-664 http://sersc.org/journals/index.php/IJAST/article/view/13965/7188
[28] Fayziyev Shokhrud Farmonovich Medical law and features of legal relations arising in the provision of medical services. International journal of pharmaceutical research Volume 11, Issue 3, July - Sept, 2019 P. 1197-1200 doi:10.31838/ijpr/2019.11.03.088 http://www.ijpronline.com/ViewArticleDetail.aspx?ID=11016
[29] Bryanskaya Elena, Fayziev Shokhrud, Altunina Anna, Matiukha Alena Topical Issues of an Expert Report in the Process of Proving in a Criminal Examination. International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-9 Issue-1, October 2019 5345-5349 DOI: 10.35940/ijeat.A2946.109119 https://www.ijeat.org/wp-content/uploads/papers/v9i1/A2946109119.pdf
[30] Fayziev Shokhrud (2019) Legal Aspects of Transplantology in the Republic of Uzbekistan. Systematic Reviews in Pharmacy, ISSN: 0976-2779, Vol: 10, Issue: 2, Page: 44-47 doi:10.5530/srp.2019.2.08 http://www.sysrevpharm.org//fulltext/196-1575419211.pdf?1586863081
[31] Tulaganova, G. Some issues of observance of international legal norms of fight against legalization of criminal incomes in the Republic of Uzbekistan Journal of Advanced Research in Dynamical and Control Systems 12(2 Special Issue), c. 143-155