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Assessment of the teaching process of the Medical Genetics subject by students of a Cuban medical school.

Valoración del proceso docente de la asignatura de Genética Médica por estudiantes de una facultad de medicina cubana.

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Summary:
Background: The Medical Genetics subject is taught in the fourth semester of the Medicine degree. During the 2022-2023 academic year, a strategy was implemented to improve the educational teaching process. Objective: to study the assessment of the teaching process of the Medical Genetics subject by Cuban students of the Manuel Fajardo School of Medicine in the 2022-2023 academic year. Methods: A cross-sectional analytical observational study was carried out on a sample of 115 students of the fourth semester of the Medicine career of the Manuel Fajardo Faculty of Medical Sciences in the capital of Cuba. Fifteen variables related to the educational teaching process previously validated by expert teachers were characterized. Results: 68.5% of the students had a favorable expectation. 60.5% of the students stated that it was difficult to understand the language used in the subject. There was a good student-teacher relationship (95.5%), support from the study group in clarifying doubts (88.5%), team study (69.8%), and the class schedule contributed to the individual study of the subject (64.0%). More than 94% of the students perceived as satisfactory the teacher's preparation, the quality of the teaching aids, the student-teacher communication, among other aspects. Conclusions: The evaluation of the teaching-educational process of the subject of Medical Genetics by Cuban students of the Manuel Fajardo School of Medicine in the 2022-2023 academic year was favorable.

Keywords: Undergraduate training, teaching-learning process, teaching-educational process, student perception, University of Medical Sciences of Havana, Medicine, Medical Genetics.

Resumen:
Antecedentes: La asignatura de Genética Médica se imparte en el cuarto semestre de la carrera de Medicina. Durante el curso académico 2022-2023 se implementó una estrategia para perfeccionar el proceso docente educativo. Objetivo: estudiar la valoración del proceso docente de la asignatura de

Genética Médica por estudiantes cubanos de la Facultad de Medicina Manuel Fajardo en el curso académico 2022-2023. Métodos: Se realizó un estudio observacional analítico transversal a una muestra de 115 alumnos del cuarto semestre de la carrera de Medicina de la Facultad de Ciencias Médicas Manuel Fajardo de la capital de Cuba. Se caracterizaron 15 variables relacionadas con el proceso docente educativo previamente validadas por profesores expertos. Resultados: El 68,5% de los estudiantes tuvieron una expectativa favorable. El 60,5% de los estudiantes afirmaron dificultad para entender el lenguaje usado en la asignatura. Hubo buena relación alumno-profesor (95,5%), apoyo del colectivo de estudio en la aclaración de dudas (88,5%) estudio en equipo (69,8%) y el horario de las clases contribuyó para el estudio individual de la asignatura (64,0%). Más del 94% de los alumnos percibieron como satisfactoria la preparación del profesor, la calidad en los medios de enseñanza, la comunicación alumno-profesor, entre otros aspectos. Conclusiones: Resultó favorable la valoración del proceso docente-educativo de la asignatura de Genética Médica por estudiantes cubanos de la Facultad de Medicina Manuel Fajardo en el curso académico 2022-2023.

Palabras Clave: Formación del pregrado, Proceso enseñanza-aprendizaje, Proceso docente-educativo, percepción estudiantil, Universidad de Ciencias Médicas de La Habana, Medicina, Genética Médica.

1. Introduction

The evaluation of the teaching-educational activity not only refers to the systematic and continuous activity to measure knowledge in the students in order to improve the teaching-educational process (1), but also to the feedback from the personological components regarding to the teaching-learning process (2). In this sense, information about the perceptions, points of view, attitudes, experiences and expectations of university students in relation to all components of the educational teaching process is fundamental and necessary, a tool that allows continuous improvement as a principle of quality. teacher (3). As a result of a process of updating and improving the curriculum of the Medicine career in Cuba, plan E is developed in the current context, which emphasizes a close link between the university and future employers.

The career is characterized by the fact that it has a total of 8,784 hours, of which 208 hours (2.36%) belong to the group of Diagnostic Investigations subjects, of which the discipline of Medical Genetics is part together with Medical Microbiology and Parasitology and Anatomy. Pathology in the second year of Medicine. The Medical Genetics subject is taught in the fourth semester of the degree with 54 declared teaching hours over 14 weeks and is made up of eight topics that guarantee the understanding of the complex biomolecular processes of the health-disease process and the new preventive approaches based on the molecular findings that are obtained with the new technological tools that derive from the development of omic sciences. During the 2022-2023 academic year, the group of professors of the subject at the Manuel Fajardo Faculty of Medical Sciences in Havana had a conceptual methodological problem: how to develop the essentials of the discipline without losing the quality of the process and, in turn, readjust and update topics so that students receive the contents close to the future performance as doctors in Primary Health Care (PHC).

Some of the modifications consisted of the following elements: creation of a virtual learning environment using the MOODLE computer platform (4), preparation of a new textbook called Fundamentals of population medical genetics (5), exercise guide for activities evaluative and the updating-improvement of some contents. In the improvement of the content system, emphasis was placed on the laws of inheritance, its link with meiosis and its transversality for the rest of the contents such as those of topic 2

(Cytogenetics and chromosomal aberrations) in the segregation of its polymorphisms, the topic 3 (transmission of simple mutations), topic 4 (genetic linkage and genetic recombination) and topic 5 (Genetic markers) specifically on the inheritance of blood groups. The concept of omic sciences was introduced, emphasizing the technological tools and the object of study of genomics, transcriptomics, and proteomics and their implications in the health-disease process. An integrative seminar was oriented on the biochemical bases of genetic diseases that began in topic 3, developed in the course of the rest of the topics and its presentation at the end of the course as a scientific work. The use of the population-based Hardy-Weinberg Law made it possible to estimate genetic risks of occurrence and recurrence in clinical situations in which the technological tools for genotype identification are not available and that registries of monogenic or Mendelian diseases are needed to achieve this purpose. and achieve an estimate of genetic risk as close to objective reality (5). Theme 6 (Multifactorial inheritance) emphasized the concepts that "we are not only products of our genes but of everything that happens around us", as well as "the genome points the gun, epigenetics adjusts the scope and the environment pulls the trigger ", providing the necessary preventive tools to reduce the incidence of congenital defects and common adult diseases. The students were given the concepts of epigenetics, nutrigenetics, nutrigenomics, pharmacogenetics, pharmacogenomics, for the development of preventive and precision medicine. The personal responsibility to control risk factors for health was discussed, not only for the sake of preserving health, but also for guaranteeing the health of future generations. Finally, topic 8 guaranteed the integration of all the aforementioned knowledge but aimed at understanding the National Program for Diagnosis, Management, Prevention and Treatment of genetic diseases and congenital defects in Cuba, and the linking of each one of the subprograms with the previous knowledge. , demonstrating to the students the strength of Cuban community genetics and the role of their future performance as a professional in maintaining and developing the same at the level of Primary Health Care. Role games, group dynamics were developed so that they perceived the link of what was learned with future professional practice.

On the other hand, the institutional policy regarding the evaluation of pedagogical processes focuses on two fundamental elements: in resolution 47/2022 "Regulation of the teaching process and work management for university careers" (7) and in the guidelines methodologies of the university for the beginning of each school year, the latter consistent with what is regulated in the legal framework of the process. From the evaluative prism of the group of professors of the Medical Genetics subject, the students have not had a leading role in the evaluation of the educational teaching process despite being regulated in the legal framework of the aforementioned resolution.

For all these reasons, the objective of this research is to present the assessment of the teaching-educational process of the subject of Medical Genetics by students of the Manuel Fajardo School of Medicine in Havana, Cuba, in the 2022-2023 academic year.

2. Methods

Type of study.

A cross-sectional and prospective observational analytical study was carried out that contributed to a basic research project of the relational investigative level and mixed paradigm (quali-quantitative).

Universe and study population

The universe of students enrolled in the fourth semester of the medical career of the 2022 school year of the "Manuel Fajardo Medicine" Faculty, who received the analytical program of the subject (N=129), was taken into account for the research. The study population was defined as 115 students.

Inclusion and exclusion criteria

The only inclusion criterion was the informed consent to be surveyed and the exclusion criteria were students who failed the subject. All were included, except 14 students who refused to participate in the research.

Variables and their operationalization

Fifteen variables related to different aspects of the educational teaching process, previously validated and approved by a committee of experts, were characterized. Student expectation was classified as a nominal qualitative variable, operationalized as favorable, unfavorable, and without expectations. The variables difficulty of understanding the language used in the subject, usefulness of the previous subjects to understand the material received, contribution of the class schedule of the subject for its individual study, good student-teacher relationship, personalized student-teacher relationship, support from the institution during the teaching-educational process, support from the study group in clarifying doubts, and team study, were classified as dichotomous nominal qualitative with Yes and NO answers. The variables teacher training, student-teacher communication, promotion of teamwork, group motivation by teachers, and quality preparation of teaching materials were classified as ordinal qualitative and characterized through a defined Likert scale. in the following categories: Excellent, Very good, Good, Regular and Bad. In order to identify the main variables that were satisfactory for the students, these were dichotomized, defining the categories of excellent, very good and good as student satisfaction; and as student dissatisfaction the rest of the categories. In relation to the state of general opinion, it was classified as a nominal qualitative variable with the dichotomy of favorable and unfavorable.

Ethical aspects

The results of this article give rise to the research project "Design and implementation of a strategy to improve the teaching-learning process for the subject of medical genetics at the Manuel Fajardo School of Medicine" approved by the Scientific Council and the Ethics Committee of the institution. It took into account respect for the autonomy of students to participate in the study as an ethical principle through informed consent as a procedure, informing them of the proper use of the results in publications and scientific events.

Techniques and procedures for obtaining information and content validation

The survey was applied through a questionnaire made up of 15 items that measured some elements of the educational teaching process in the subject. This questionnaire was validated by ten experts from the specialty of clinical genetics and Pedagogy, 100% hold the academic category of master's degree and three the scientific degree of doctor of sciences. 100% have a higher teaching category of assistant or holder. Aiken's V coefficient (1) was calculated in order to verify if the selected items adequately measure the selected processes. For the validation process, a scale from 1 to 5 was taken into account: Totally disagree (TD), disagree (D), neutral (N), agree (A) and totally agree (TA) in relation to two aspects. : the representativeness of the item and the clarity of its wording. The validation results are reflected in Table 1. A 0.75 was used as the cut-off point to consider the item as valid. The 15 items were considered useful for the investigation. The global Aiken V

coefficient was 0.97; classifying the instrument as suitable for research. Subsequently, a pilot study was carried out, by applying the questionnaire to a non-probability sample defined at the convenience of 25 students with the objective of analyzing the understanding of the different items of the questionnaire.

Table 1. Results of the content validation process with the Aiken V Coefficient.

	Item	Representative item	Clarity in writing	Overall Coefficient
1	Student expectations	1.00	1.00	1.00
2	Difficulty understanding the language used in the subject.	0.98	1.00	0.99
3	Usefulness of the previous subjects to understand the material received.	0.98	1.00	0.99
4	Contribution of the class schedule of the subject for its individual study.	0.98	1.00	0.99
5	Good student-teacher relationship	0.98	1.00	0.99
6	Personalized student-teacher relationship	0.98	0.95	0.97
7	Support from the institution during the teaching-educational process	0.98	1.00	0.99
8	Support of the study group in clarifying doubts	0.83	0.98	0.91
9	Team study	0.83	1.00	0.92
10	Teacher training	0.80	0.95	0.88
11	Student-teacher communication	0.98	0.95	0.97
12	Promotion of teamwork	0.98	0.95	0.97
13	Motivation of the group by the teaching staff	0.95	0.93	0.94
14	Quality preparation of teaching materials.	0.95	1.00	0.98
15	State of opinion of the student on the subject	1.00	1.00	1.00
	Average	0.95	0.98	0.97

Information processing and analysis

A database was created on the Statistical Package of Social Science SPSS platform (version 25.0) in order to perform statistical processing. Descriptive statistics such as percentage were used as a measure of relative frequency. The Proportions Difference Hypothesis Test was used with a level of statistical significance of α=0.05, with the aim of determining if there are differences in the sample of those who responded affirmatively with respect to those who did not for a group of items. . Fisher's Exact Probabilities Test was used with the objective of determining if there is a significant association between the state of favorable opinion or not regarding the process and a set of variables that could support satisfaction. The Odds Radius (OR) was calculated as a measure of the magnitude of the association and its confidence interval (CI) was estimated for 95%. For the statistical decision making, the same level of statistical significance was also considered.

3. Results

One of the questions that the students were asked was about their expectations with the subject. In 68.5% of the students it was favorable, in 26.9% unfavorable and in 4.6% they manifested themselves without expectations. Despite the fact that 60.5% of the students stated that they had difficulty understanding the language used in the subject, the majority expressed their opinion in favor of the usefulness of the previous subjects to understand the material received, on the contribution of the class schedule of the subject for individual study, good student-teacher relationship, support from the study group in

clarifying doubts and teamwork, with significant differences ($p<0.05$). However, the difference in the responses related to institutional support for the teaching process of the subject was not significant (Table 2). The student perception of some variables that refer to the group of teachers is located on the scales of excellent, very good and good (Table 3). If the level of perception of these three scales is dichotomized as satisfactory, the training of the group of teachers gave them the greatest satisfaction, followed by the quality preparation of teaching materials (Figure 1).

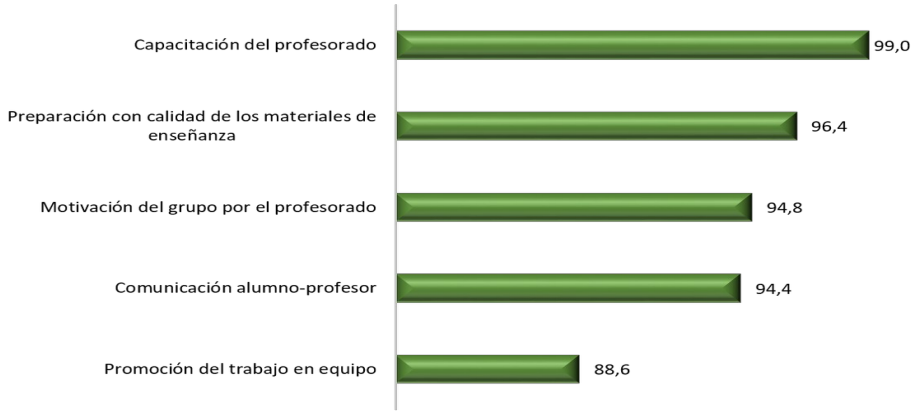

Figura 1. Distribución (%) de la satisfacción de los estudiantes por los profesores.

In relation to the state of global opinion of the students for the subject, 96 (83.5%) did so favorably. Two factors were related to this finding: student-teacher communication ($p=0.02$; OR= 21.11) and group motivation by teachers ($p=0.007$; OR= 17.62), (Table 4). . Students who answered the student-teacher relationship as satisfactory were 21 times more likely to consider the overall opinion of the course as favourable.

4. Discussion

In resolution 47/2022 of the Ministry of Higher Education of Cuba (MES), all methodological teaching work is regulated, and in its article 127 its main functions related to planning, organization, regulation, evaluation and control of the teaching process are defined. -educational, whose result achieves the integration of the academic, labor and research components that contributes to a higher quality in the training process (7). Through the control of the teaching process, the quality of the results is evaluated in three fundamental aspects: 1) the planning and organization of the teaching process at its different organizational levels (subject group, discipline group, year group and career group), 2) the execution of the process and 3) the preparation acquired by the graduates (7). To control the quality with which it is executed, article 200 defines the results of the evaluation of the students, the fulfillment of the study programs, and the opinions of the students cannot be absent. Three evaluative cuts are made, the first in the middle of each school period, the second at the end of each school period and the third once the three exam sessions planned for said period have concluded (7). The results of the academic training in medical genetics are determined by the performance of the teachers and the learning results of the students. Coinciding with González (8), the effect obtained on the students focused not only on academic performance, but also on the assessment of their experiences during the formative process of the subject. Academic expectations refer to the commitment to reach a level or a goal, to the way in which students imagine a project in the medium or long term. These may be influenced by personal abilities and interests, the family environment and the school environment in which they develop (9). Authors such

as Polanco (10), refer to the direct relationship between these and academic well-being, playing an important role in university success.

In relation to the expectations shown by the students in this research, beyond individual abilities, responsibility for their own learning and motivation, research such as Khattab's (11) confirms the fact that high expectations do not guarantee to obtain good grades, nor do the low ones imply worse results. Other studies report that those who maintain high expectations are more likely to finish their studies and obtain high grades (12). It is explicit that meeting these initial expectations is a key factor in determining educational quality (13). In a general sense, the investigations that analyze and address the expectations of university students do so in relation to the training process, the institution, the Teaching-Learning Process (PEA), and the career as a whole, there are fewer studies that based on subjects (14). Medical Genetics is a discipline, whose contents have been selected from the knowledge and study methods of Basic Sciences, preceded by others such as Cellular and Molecular Biology, Cellular and Integumentary Tissue and Ontogeny, which, through their various contents , complexity, and basic concepts, provide the necessary tools that allow the integral development as part of the human organism, to respond to the training of the basic general practitioner (15-16), a foundation that explains the state of opinion of the students in relation to to the previous subjects.

The results of the indicators explored in Table 2 coincide with other similar investigations (17,18), in which the students positively valued the role of teachers in the teaching-educational process, recognizing the usefulness of the subjects of the cycle basic for their training, the class schedule, the good student-teacher relationship, teamwork, among other aspects. One of the factors that influenced teacher training was the development of collegiate teaching-methodological activities, which allowed the development of practical classrooms and uniform evaluations. Group work was encouraged and the presentation of the final subject closing work was perfected according to the individual and integrating experience, referring to topic 8. Individualized participation in teacher consultations was favored according to the needs of the students with full accessibility of teachers for tutoring and academic guidance through WhatsApp groups and discussion forums and chats in the virtual environment. In the latter, the maximum objectives and schedule compliance were not achieved, due to connectivity difficulties of the faculty and the national network. The bibliography and didactic materials were updated in each topic, which were considered useful to carry out the oriented tasks and for learning in general. Finally, the evaluation methods corresponded to the teaching development of the subject.

The aforementioned favors an innovative, high-quality educational teaching process, which justifies the favorable opinion of the subject by the students. These results coincide with those obtained in the Satisfaction Survey applied to students, referring to the Teaching Activity of the teaching staff of the University of Salamanca in the 2019-2020 academic year (19). Another peculiarity was the diverse composition of the faculty of the subject, with a high scientific and pedagogical level. Composed of 8 professors, 4 clinical genetics specialists and 7 masters of science in genetic counselling. Of them 1 full professor who in turn is a doctor of science, 2 assistants and 4 assistants. All with more than 10 years of experience in teaching work. This reaffirms what Cabrera (20) referred to, which favors the satisfactory results achieved in student learning. Regarding the preparation and quality of teaching materials, a virtual classroom for the subject was available for the first time, based on the active participation of students, with the necessary pedagogical tools and the provision of virtual clinical cases, which raised the expectations of the students, in investigative processes, criteria that coincide with investigations such as those of Miguel R

et al (21). The usefulness perceived by students regarding e-learning represents a satisfactory experience, with a better willingness to participate in new courses of this modality, which undoubtedly allows an influence on the perception of the benefits that it brings to teacher development. educational (22-24). The second factor related to the overall satisfaction of the students was the motivation of the group by the teaching staff. The motivational climate in class is argued in the activities that the teacher does to motivate learning in his students (25). The researchers acknowledge that the strategies used to start some of the teaching activities contributed to this.

Table 2. Components of the educational teaching process in the subject of medical genetics.

Variables	Yes		No		Z estimator	p*
	N.	%	N	%		
Difficulty understanding the language used in the subject.	69	60.5	45	39.5	3.04	0.002
Usefulness of the previous subjects to understand the material received.	68	59.6	46	40.4	2.78	0.005
Contribution of the class schedule of the subject for its individual study.	71	64.0	40	36.0	4.02	0,000
Good student-teacher relationship	107	95.5	5	4.5	13.49	0,000
Personalized student-teacher relationship	65	57.5	48	42.5	2.12	0.03
Support from the institution during the teaching-educational process	64	56.6	49	43.4	1.86	0.06
Support of the study group in clarifying doubts	100	88.5	13	11.5	11.44	0,000
Team study	74	69.8	32	30.2	5.63	0,000

*, p value of a Test of difference of proportions hypothesis for a sample. Z estimator for a Proportion Differences Hypothesis test.

Table 3. Opinion of the students about the teachers of the subject.

Variables	Excellent		Very good		Good		Regular		Evil		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Teacher training	90	79.6	17	15.0	5	4.4	1	0.9	0	0	113	100
Student-teacher communication	56	49.1	43	37.7	11	9.6	2	1.8	2	1.8	114	100
Promotion of teamwork	54	47.4	31	27.2	16	14.0	11	9.6	2	1.8	114	100
Motivation of the group by the teaching staff	67	58.8	28	24.6	13	11.4	5	4.4	1	0.9	114	100
Quality preparation of teaching materials.	71	63.4	27	24.1	10	8.9	3	12.7	1	0.9	112	100

Table 4. Related factors that explain the state of opinion of the students.

Satisfaction for	Favorable opinion status		Unfavorable opinion status		TEF (p)	OR	CI (95%)
	N	%	N	%			
teacher training	95	100.0	11	100.0	-	-	-
Student-teacher communication	95	98.9	9	81.8	0.02	21.11	1.74;256.13
Promotion of teamwork	87	90.6	9	81.8	0.31	2.14	0.40;11.51
Motivation of the group by the teaching staff	94	97.6	8	72.7	0.007	17.62	2.55;121.34
Quality preparation of teaching materials.	91	96.8	10	90.9	0.36	3.03	0.28;31.98

OR: Odds Radio or Odds Ratio; p, p value for the Fisher's Exact Probabilities Test (TEF).

The presentation of clinical cases attended in the consultations of the professors who gave testimony of the process of diagnosis and management of the cases was highly appreciated by the students. Another of the faculty's strategies was to reconcile management and organization in a similar way in each of the 6 groups with which they worked during the course. What allowed, among other things, to give them an idea of a group of cohesive colleagues. Feedback and evaluation were also standardized for what contributed to the methodological activities of the group and the virtual teaching-learning environment.

All of the above mentioned as a whole fosters a motivation that bet towards student learning. A team of Bolivian researchers who investigated the relevance of motivation in the academic performance of students agree with this study (26). Students are the source of basic information to assess the quality, relevance and equity of their own training, as well as the strengths and weaknesses of the process and its results (27-28). One of the limitations of the research was that satisfaction information is only presented from the student's point of view, and this issue must be explored from other angles, such as the teacher or the institutional one, which would allow other studies to obtain a global vision of the process.

5. Conclusions

- The assessment of the teaching-educational process of the subject of Medical Genetics was favorable, the strategy of improvement of the subject being effective.
- In this era of genomics and other omic sciences and the high technology that derives from them, developing an innovative, creative, and reflective educational teaching process becomes a challenge for the teacher that must be constantly evaluated by the students. .
- Genetics is misperceived by students as a science cloistered in a glass case, an elite specialty with no link to the community that treats rare and esoteric diseases. In this sense, the teacher must change educational paradigms that guarantee a closer approach of the subject to the performance that they will develop in the future as comprehensive general practitioners.

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