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Effect of educational intervention on knowledge and attitude towards research, research ethics, and biobanks among paramedical and administrative teams in the National Liver Institute, Egypt

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Abstract

Background: Medical research has increased greatly in many developing countries during the recent decade, motivated by the need to improve health in these countries. Such research needs to be guided by fundamental ethical principles to ensure the protection of patient's rights and welfare. Also, biobanks have become increasingly important for the study of health and disease. There is a significant public interest in the outcomes of genetic research, which include diagnostic, therapeutic, and preventive health methods. This study was conducted to assess and raise the knowledge and attitude towards several aspects of research, related ethics, and biobank ethical issues for paramedical and administrative teams working at the National Liver Institute (NLI).

Results: The education intervention study was effective in increasing percentage of good knowledge in paramedical and administrative teams (p value < 0.001). Also, the education intervention study was effective in increasing percentage of positive attitude in paramedical and administrative teams (p value < 0.001).

Conclusion: There were good knowledge and attitude about research and related ethics, but poor knowledge and attitude about biobanking. The educational intervention study significantly increased knowledge and attitude about research, related ethics, and biobanks.

Keywords: Research, Research ethics, Biobank, Paramedical team, Administrative team, Egypt

Background

The most essential component of a successful research program is developing a well-qualified research staff or team. Clinicians, research nurses, data managers, and study coordinators are an example of research team [1]. Some of their responsibilities are regulatory compliance, protocol maintenance, patient care, tissue acquisition and transmittal, data collection and submission, and general administration. All these tasks are not accomplished by

individual work, but by collective action and cooperation of all members of the research team, so successful management requires a shared commitment to excellence, mutual respect for each team's role, and effective communication. Once staff are trained and the data management system implemented, this infrastructure must be maintained and continuously updated. Ultimately, an effective leader in research plans must recognize the value of each member while fostering team culture and commitment to quality patient care [1]. More than 30% of the total time and effort needed to implement a clinical trial research is the contribution of nurses, as well as data manager [2]. This indicates the important role of paramedics (e.g., nurses) and administrative members in doing researches.

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There is a need to improve health in many developing countries, so medical research has grown exponentially in these countries in the last decade [3]. Only 177,824 Egyptian reports were published between 1996 and 2017, compared with the USA with 110,364,243 published documents. However, Egypt ranks 39th in the number of publications between 1996 and 2017 [4]. There were only 669.3 Egyptian researchers per million inhabitants in 2017, while 4673.2 researchers per million inhabitants in the USA and 2407 researchers per million inhabitants in the United Arab Emirates [5].

Because people are involved in medical research, the research should be guided by basic ethical principles to ensure that their rights and well-being are protected. In addition, international standards require that research findings be reviewed by the research ethics committees (RECs) [6].

Biobanks are becoming increasingly important for health and disease research. The public interest in the results of research and genetic research, including methods and products for diagnosis, therapy, and preventive health, is also high [7]. A full interaction between a wide range of stakeholders involved in the biobank, including the public, patients, health professionals, government, and donors, is important due to the current shift to precision medicine [8]. The survival of biobanks and genetic research need a public support, understanding, and active participation [9].

The main *objective* of the current study was to assess and raise the knowledge and attitude about research, research ethics, biobanks, and their willingness to donate biospecimens among paramedical as well as administrative teams working at NLI, Menoufia University, Egypt.

Methods

Ethical point of research

- Firstly, the study protocol was submitted to get approval from the Research Ethics Review committee at National Liver institute (NLI) (IRB00003413), Menoufia University.
- Written consent was taken from the participating subjects in the study for answering the questionnaire after being informed of the full details of the research including risks and benefits.
- Confidentiality of the information was assured.

Study design

This study was divided into two parts: the first is cross-sectional study and the second is a quasi-experiment pretest-posttest design study which was conducted at the National Liver Institute (NLI) during the period from 1 May 2017 to the end of July 2019. The number of participants included in this study was 185

participants; 70 paramedics (nurses, X-ray technicians, and laboratory personnel) and 115 administrative participants of both sex and any age. Firstly, all of the participants had a discussion about the objectives and all details about the study before they gave their written consent. Secondly, they were assessed about knowledge, attitude towards several aspects of research, and research ethics and biobanking through *pre-designed self-administered questionnaire* in Arabic language (the cross-sectional study). Thirdly, implementing an interventional educational study was done through lectures and handouts. The lectures content included the following: (1) importance, definition, importance, and characteristics of research; (2) definition, importance, and guiding principles of research ethics; and (3) definition, importance, sampling, donors, and biobank privacy. Also, lectures and meeting emphasized the importance of research team and the main role of paramedic and administrative teams in doing any research.

This interventional educational study day was repeated six times which is about research and its importance, research ethics with its guiding principles, and biobanks and how to encourage donation and inform general population to it. Finally, Re-assessment of knowledge and attitude towards several aspects of Research, Research ethics, and biobanking through the same questionnaire after three months of the intervention study in order to make sure the information is clear and to evaluate the effect of the intervention study with the delivery of certificates to those who completed the course and handed over questionnaires.

Data collection and scoring

A pre-designed self-administered Arabic language questionnaire was used after validation and reliability. *Validation* was done by submitting it to a panel of four experts to test its validity; the experts were two professors, 1 assistant professor, and 1 lecturer of community specialties, and the experts reviewed the tool for content accuracy and internal validity. Also, professors were asked to judge the items for completeness and clarity (content validity). Suggestions were incorporated into the tool. *Test-retest reliability* was applied by the researcher for testing the internal consistency of the study tools. It was done through the administration of the same participants under similar conditions on two occasions 1 week apart. The tools' reliability has been verified with Cronbach's α values of 0.70.

The questionnaire included three sections: the first is to collect data about socio-demographic characters and the other two sections to measure knowledge and attitude regarding research, research ethics, and biobanks. The knowledge scale consists of 13 items using a 2-point Likert-type scale: 1 for correct answer and 0 for do not know or wrong answer. The total knowledge score

ranged from 0 to 13. The knowledge was considered good if percentages of knowledge score were more than 70% and poor knowledge if percentage was equal to or less than 70%. The attitude scale consists of 13 items using a 3-point Likert-type scale (agree, neither agree nor disagree, disagree) to measure attitudes about research, research ethics, and biobanks. The scale includes both positively and negatively worded items: 2 for positive attitudes, 1 for neither agree nor disagree, and 0 for negative attitudes. The total attitude score ranged from 0 to 26. The attitude was considered positive if percentages of attitude score were more than 70% and negative if percentage was equal to or less than 70%.

Statistical analysis

Results were collected, tabulated, and statistically analyzed by an IBM-compatible personal computer with SPSS statistical package version 22. Data were shown as mean, range or value, and frequency and percent. Descriptive statistics, e.g., number (no), percentage (%), mean (\bar{X}), and standard deviation (SD). Tests of normality distribution were done by Kolmogorov-Smirnova test and Shapiro-Wilk test for all quantitative data. McNemar test was used to study the association between paired qualitative variables. Wilcoxon test was used to compare the mean and SD of paired

quantitative not normally distributed data. p value of < 0.05 was considered statistically significant.

Results

The majority of paramedical and administrative teams were females (85.7% and 67.8% respectively); their mean age was 31.9 ± 10.8 and 41.6 ± 8.8 years, and most of them had B.A. (57.1% and 60% respectively). Approximately three quarters of studied paramedical and administrative team had no enough income (75.7% and 73% respectively) (Table 1).

The results demonstrate that only 18.6% and 13.9% of paramedical team and administrative teams respectively had a previous participation in a scientific research, and 94.3% and 85.3% of them respectively knew that scientific research is important in helping to serve patients. However, only 34.3% and 40.9% of paramedical team and administrative teams respectively knew by the presence of the National Liver Institute Research Ethics Committee. Also, only 22.9% and 27% of them respectively knew that there is a biobank at the National Liver Institute (Table 2).

The education intervention study for the paramedical team had a high significant increase of mean total knowledge score post-intervention (12.2 ± 0.5) than pre-intervention (7.8 ± 2.4) (p value < 0.001), as the

Table 1 Sociodemographic data of paramedical and administrative team of our studied participant at the National Liver Institute of Menoufia University

Demographic criteria	Paramedical (70)		Administrative team (N = 115)		Total (N = 185)	
	No	%	No	%	No	%
Sex						
Male	10	14.3	37	32.2	47	25.4
Female	60	85.7	78	67.8	138	74.6
Age (years)						
Mean \pm SD	31.9 \pm 10.8		41.6 \pm 8.8		38.2 \pm 10.57	
Median (range)	27.5 (21–59)		40.5 (22–59)		40 (21–59)	
Education						
Health technical institution	21	30	–	–	21	11.4
Secondary education or equivalent	8	11.4	42	36.5	50	27
University education	40	57.1	69	60	109	58.9
Master and PhD	1	1.4	4	3.5	5	2.7
Job						
Nursing	41	58.6	–	–	41	22.2
Technician	29	41.4	–	–	115	62.2
Employee	–	–	115	100	29	15.7
Income status						
Not enough	53	75.7	84	73	137	74.1
Enough	17	24.3	30	26.1	47	25.4
More than enough	0	0	1	0.9	1	0.5

Table 2 Research, related ethics, and biobank knowledge of the studied paramedical and administrative team participants, pre-intervention

Research, research ethics, and biobank knowledge items	Paramedical (N = 70)						Administrative team (N = 115)					
	Yes		No		Do not know		Yes		No		Do not know	
	N	%	N	%	N	%	N	%	N	%	N	%
1. Previous participation in a scientific research.(yes)	<i>13</i>	<i>18.6</i>	57	81.4	0	0.0	<i>16</i>	<i>13.9</i>	99	86.1	0	0.0
Scientific research is important in:												
2. Raising the degree in job (yes)	63	90	7	10.0	0	0.0	95	82.6	18	15.7	2	1.7
3. Discovering a new treatment for diseases (yes)	56	80	12	17.1	2	2.9	94	81.7	18	15.7	3	2.6
4. Contributing in the development of communities(yes)	63	90	7	10.0	0	0.0	102	88.7	13	11.3	0	0.0
5. Helping to serve patients(yes)	66	94.3	4	5.7	0	0.0	98	85.2	10	8.7	7	6.1
6. There is no obvious importance to scientific research (no)	54	77.1	13	18.6	3	4.3	37	32.2	78	67.8	0	0.0
7. Presence of the National Liver Institute research ethics committee (yes)	<i>17</i>	<i>24.3</i>	30	42.8	23	32.9	<i>47</i>	<i>40.9</i>	58	50.4	10	8.7
8. Doing a research on patient or use their data without their permission (no)	6	8.6	64	91.4	0	0.0	30	26.1	82	71.3	3	2.6
9. Knowing biobanks (yes)	<i>15</i>	<i>21.4</i>	48	68.6	7	10.0	<i>31</i>	<i>27</i>	50	43.4	34	29.6
10. Biobanks are useful for science, scientific research, and society (yes)	<i>28</i>	<i>40</i>	32	50.0	7	10.0	<i>46</i>	<i>40</i>	49	42.6	20	17.4
11. Patients are the only donors to biobanks (no)	41	58.6	26	37.1	3	4.3	60	52.2	41	35.6	14	12.2
12. Taking blood or urine samples from the patient without his knowledge (no)	5	7.1	65	92.9	0	0.0	14	12.2	101	87.8	0	0.0
13. Presence of a biobank at the National Liver Institute (yes)	<i>16</i>	<i>22.9</i>	30	42.8	24	34.3	<i>31</i>	<i>27</i>	64	55.6	20	17.4

Correct answers are in italics, and the most frequent answers are in boldface

education intervention study was effective in decreasing percentage of poor knowledge from 78.6% pre-intervention to 0% post-intervention and in increasing percentage of good knowledge from 21.4% pre-intervention to 100% post-intervention, and this effect was highly statistically significant (p value < 0.001). Also, the education intervention study for the administrative team had a high significant increase of mean total

knowledge score post-intervention (12.1 ± 0.5) than pre-intervention (7.5 ± 2.7) (p value < 0.001). Also, the education intervention study was effective in decreasing percentage of poor knowledge from 78.3% pre-intervention to 0.9% post-intervention and in increasing percentage of good knowledge from 21.7% pre-intervention to 99% post-intervention, and this effect was highly statistically significant (p value < 0.001) (Fig. 1).

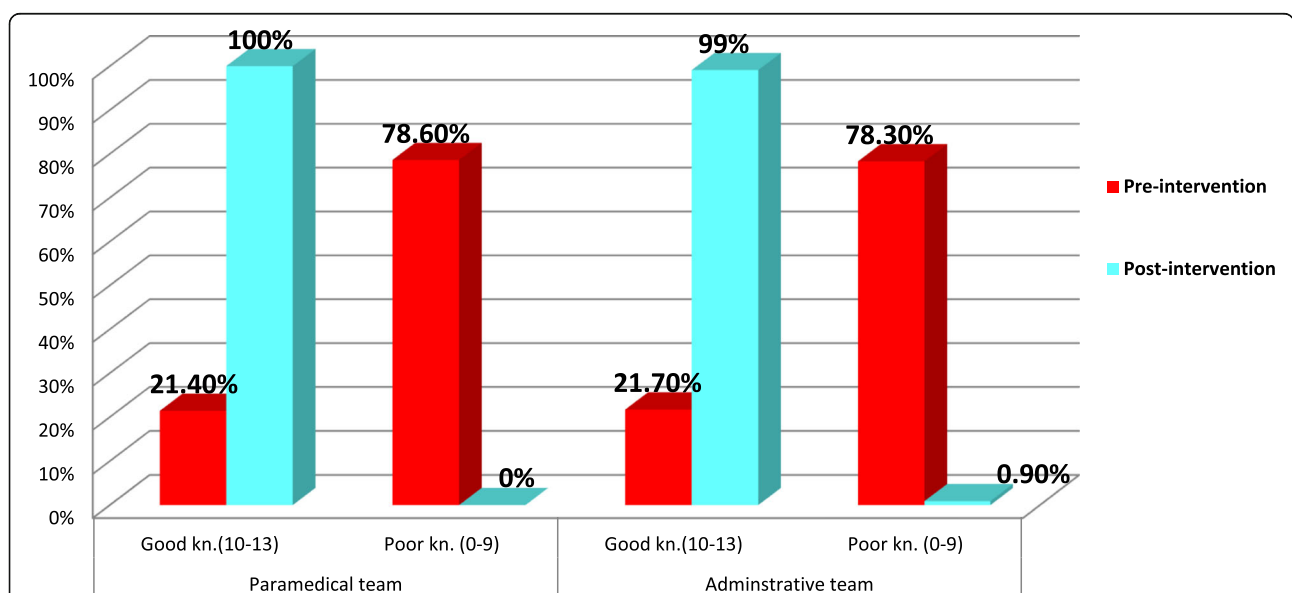


Fig. 1 Effect of education intervention on total knowledge scores of the paramedical and administrative team participants, pre and post-intervention

The results demonstrated a high percent positive attitude in most of attitude items for the paramedical and administrative team participants: 91.4% of paramedical team participants had positive attitude to “patients’ outcomes improve with continuing medical research,” while 77.4% for the administrative team; 92.9% of paramedical team participants had positive attitude to “Ethics Committee of Scientific Research is useful,” while 86.1% for the administrative team; and 91.4% of paramedical team participants had positive attitude to “research should be reviewed for ethical standards before completion of the research,” while 87% for the administrative team. However small percentage of 40% of the paramedical team participants had positive attitude to “helping in collection of samples for a biobank” while 36.6% for the administrative team, and 38.6% of paramedical team participants had positive attitude to “giving a samples to a biobank,” while 35.7% for the administrative team (Table 3).

The education intervention study for paramedical team had a high significant increase of mean total attitude score post-intervention (25.3 ± 0.9) than pre-intervention (21.6 ± 2.4) (p value < 0.001), as the education intervention study was effective in decreasing percentage of negative attitude from 10% pre-intervention to 0% post-intervention and in increasing percentage of positive attitude from 90% pre-intervention to 100 % post-intervention, and this effect was highly statistically significant (p value < 0.001). Also, the education intervention study for administrative team had a high

significant increase of mean total attitude score post-intervention (25.5 ± 0.8) than pre-intervention (20.7 ± 3.3) (p value < 0.001), as the education intervention study was effective in decreasing percentage of negative attitude from 21.7% pre-intervention to 0% post-intervention and in increasing percentage of positive attitude from 78.3% pre intervention to 100 % post-intervention, and this effect was highly statistically significant (p value < 0.001) (Fig. 2).

Discussion

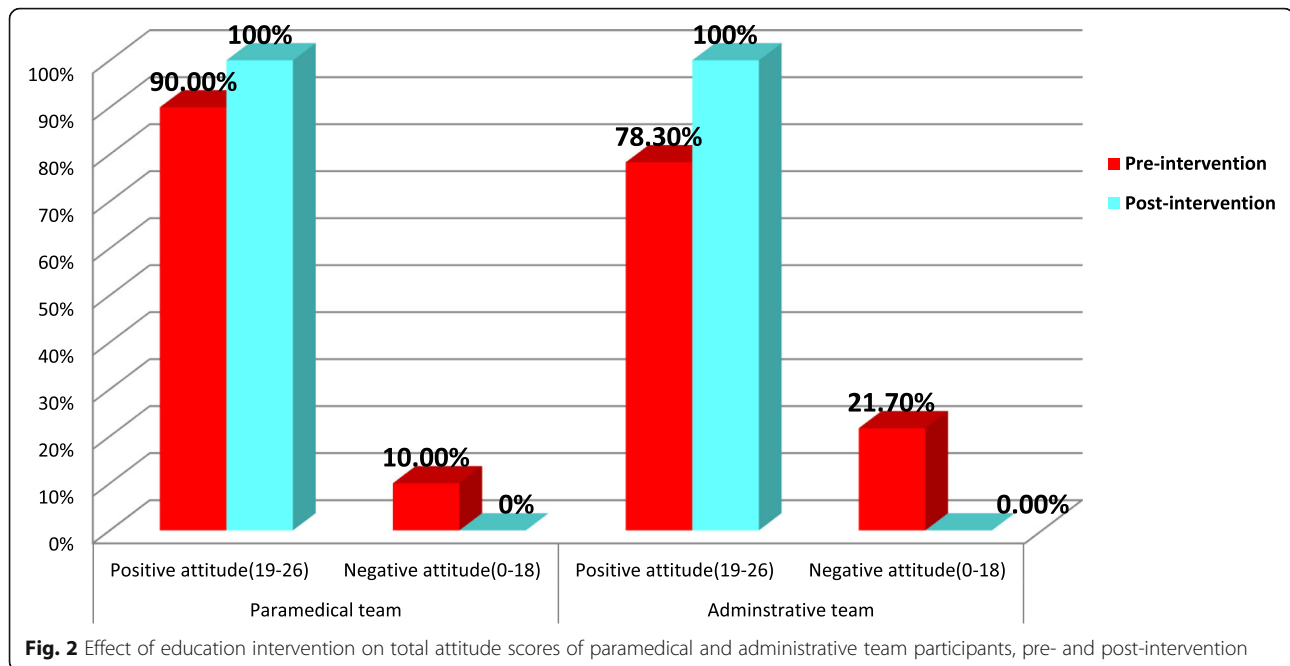
Very small articles were published to assess research and related ethics knowledge of paramedical personnel, and specifically, participants were nurses only. In addition, no previous studies had been conducted for administrative team. So, the present study was done on paramedical and administrative teams working at NLI for assessing and rising knowledge and attitude about research, related ethics, and biobanks by educational intervention.

Regarding research participation and knowledge of the study participants, only 18.6 % and 13.9% of paramedical team and administrative teams respectively had a previous participation in a scientific research which is considered to be low participation. This was in contrast with Abouelfetoh and Al Ateeq’s study where 31.2% (206/660) of paramedical nurses had a previous participation on a research [10]. This difference may be due to the fact that in current study paramedical team included technicians who were not interested in doing medical

Table 3 Research, research ethics, and biobank attitude of the studied paramedical and administrative team participants, pre-intervention

	Paramedical (70)						Administrative team (N = 115)					
	Agree		Fair		Disagree		Agree		Fair		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
14. Patients’ outcomes improve with continuing medical research.	64	91.4	6	8.6	0	0	89	77.4	25	21.7	1	0.9
15. The employee should be trained in scientific research and was mandatory.	43	61.4	26	37.1	1	1.4	83	72.2	31	27	1	0.9
16. Participation in future scientific research.	57	81.4	13	18.6	0	0	75	65.2	32	27.8	8	7
17. Ethics Committee of Scientific Research is useful.	65	92.9	5	7.1	0	0	99	86.1	16	13.9	0	0
18. Research should be reviewed for ethical standards before completion of the research.	64	91.4	6	8.6	0	0	100	87	15	13	0	0
19. Research ethics should be taught as a mandatory university unit.	53	75.7	15	21.4	2	2.9	90	78.3	25	21.7	0	0
20. Patients should be informed of the full details of the research including risks and benefits and written consent.	59	84.3	6	8.6	5	7.1	84	73	20	17.4	11	9.6
21. Helping in collection of samples for a biobank.	28	40	42	60	0	0	42	36.6	61	53	12	10.4
22. People who provide vital samples help diagnose diseases	33	47.1	36	51.4	1	1.4	60	52.2	54	47	1	0.9
23. People who give vital samples help prevent diseases	26	37.1	42	60	2	2.9	51	44.3	56	48.7	8	7
24. Giving biological sample is for the greater good of society.	41	58.6	29	41.4	0	0	64	55.7	50	43.5	1	0.9
25. Giving samples to a biobank.	27	38.6	34	48.6	9	12.9	41	35.7	59	51.3	15	13
26. Assisting in the collection of samples for the NLI biobank.	63	90	5	7.1	2	2.9	75	65.2	36	31.3	4	3.5

Positive attitude answers are in italics, and the most frequent answers are in boldface



research and nurses who were not yet involved in medical research and had no sufficient opportunities for involving in research.

In the present study, 94.3% and 85.3% of the paramedical team and administrative teams respectively knew that scientific research is important in helping to serve patients which was a high level of knowledge in comparative to Abouelfetoh and Al Ateeq's study where nurses' knowledge about research were moderate [10]. This indicates that the NLI paramedical and administrative teams need only opportunity to participate in a research with their high knowledge about research importance.

Regarding research ethics knowledge of the study participants, more than 90% of the paramedical team and two thirds of the administrative team knew about research ethics and knew that doing a research on patient or use their data without their permission is not ethical or permissible. This result was in agreement with Adhikari et al.'s study where 96.5% of nurses knew the importance of confidentiality and patient data security [11] and also in Aliyu et al.'s study where the majority of the nurse participants (82.6%, 114 out of 138) possess good knowledge of ethical dilemma [12].

Regarding biobank knowledge of the study participants, unfortunately, only 34.3% and 40.9% of the paramedical team and administrative team respectively knew the presence of the National Liver Institute Research Ethics Committee. This may be due to the low participation in research.

Also, only very small percentage of paramedical and administrative teams knew about biobanks and that

there is a biobank at the National Liver Institute. This result was in agreement with Eisenhower's study in which the overall knowledge scores were very low [13] and also in Igbe and Adebamowo's study in Nigeria; the participants had limited knowledge of biobanking and its implications [14]. It has the same results as Ahram et al.'s study [15]. This limited knowledge may be due to the field of biobanking being new with no good public dissemination.

Regarding the education intervention study and knowledge for participants, in the current study, the mean total knowledge scores about research, ethics, and biobank pre-intervention for paramedical and administrative teams were 7.8 ± 2.4 and 7.5 ± 2.7 respectively (out of 13 total score). Actually, intervention education study had a significant increase in mean total knowledge scores for both group post-intervention as 12.2 ± 0.5 for the paramedical team and 12.1 ± 0.5 for the administrative team.

Fortunately, at the current study, the paramedical education intervention study was highly effective in increasing percentage of good knowledge from 21.4% pre-intervention to 100% post-intervention, and this effect was highly statistically significant (p value < 0.001). In addition, the administrative team education intervention study was highly effective in increasing percentage of good knowledge from 21.7% pre-intervention to 100% post-intervention, and this effect was highly statistically significant (p value < 0.001), which were very impressive results suggesting more and more intervention educations to raise their knowledge.

Regarding research attitude of the study participants, more than 90% of the paramedical team and three

quartiles of the administrative team had positive attitude towards continuous medical research. This result was with more positive attitude than Abouelfetoh and Al Ateeq's study in which nurses' attitude levels were moderate [10]. Nearly two thirds of the study participants agreed that the employee should be trained in scientific research and nearly three quartiles agreed to participate in research in the future which is indicating good positive attitude towards research.

Regarding research ethics attitude of the study participants, three quartiles of the study participants (paramedical and administrative teams) agreed that research ethics should be taught as a mandatory university course. Also, most of the study participants (92.9% of paramedical and 86.1% of administrative teams) agreed that the Ethics Committee of Scientific Research is useful. This was in agreement with Adhikari et al. study where 98.8% nurses (85 out of 86) agreed that ethics course should be taught in every medical/nursing teaching institution [11].

At the present study, 84.3% of paramedical and 73% of administrative teams agreed that patients should be informed of the full details of the research including risks and benefits and written consent. This was in agreement with Adhikari et al.'s study where 89.5% of nurses agreed that consent is not only for surgeries and it is for any intervention, as well as Aliyu et al.'s study where the majority (83%, 116 out of 140) of the nurse participants admitted that consent should be obtained for both operations and nursing procedure [12].

Regarding biobanks attitude of the study participants, only 47.1% of the paramedical and 52.2% of the administrative team agreed to provide vital sample to help in the diagnosis of diseases in a biobank; also, only 40% of the paramedical and 36.6% of the administrative teams agreed to help in the collection of samples for a biobank. This is in contrast to Alzoubi's study where there was overwhelming support (> 85%) for the establishment of biobanks in Jordan, and most of the participants agreed on the importance of biobanks and sample donation in promoting medical research [16]. Also, all of interviewees were willing to share their blood sample or donate it to biobank for future use in Sakulthaew et al.'s study, and in Igbe and Adebamowo's study, the majority of the participants were willing to participate in biobank research for non-communicable diseases [14, 17]. Biobank attitude of the study participants had less positive attitude than research and research ethics attitude; this may be due to their less knowledge about biobanking. But fortunately, 90% of nurses and 65.2% of administratives agreed to assist in the collection of samples for the NLI biobank.

Regarding the education intervention study and attitude for participants, in the current study, the mean total attitude score about research, ethics, and biobank

pre-intervention for paramedical and administrative teams were 21.6 ± 2.4 and 20.7 ± 3.3 respectively (out of 26 total score).

Actually, intervention education study had a significant increase in the mean total attitude scores for both groups post-intervention as 25.3 ± 0.9 for the paramedical team and 25.5 ± 0.8 for the administrative team.

Fortunately, at the current study, the paramedical team education intervention study was highly effective in increasing the percentage of positive attitude from 90% pre-intervention to 100% post-intervention, and this effect was highly statistically significant (p value < 0.001). Also, the administrative team education intervention study was highly effective in increasing the percentage of positive attitude from 78.3% pre-intervention to 100% post-intervention, and this effect was highly statistically significant (p value < 0.001).

Conclusion

To the best of our knowledge, this study is the first to evaluate and elevate knowledge and attitude towards research, related ethics, and biobanks among paramedical and administrative teams.

Our study shows that there were good knowledge and attitude about research and related ethics, but insufficient knowledge and attitude about biobanking. However, fortunately, the educational intervention study significantly increased knowledge and attitude about research, related ethics, and biobanks. These approaches have the potential to build trust, including providing a venue to address common concerns about research, related ethics, and biobanks.

Recommendation

There is a need for more training and time spent in the Menoufia University on research methods, related ethics, and biobanking intervention education workshops or training for paramedical and administrative team participants. There is also a need to do further studies in other Egyptian universities and other Middle Eastern medical schools. The findings of this study may guide future development and improvement of training or workshop to put more emphasis on building research skills, ethics, and biobanks. There is a need for adding research methodology, research ethics, and biobanking as a curriculum in nursing faculties for enriching their knowledge.

Limitation of study

Due to the too busy schedule of administrative and paramedical participants, they were reluctant for attending intervention education study. Six education intervention days were held to overcome this limitation.

Abbreviations

NLI: National Liver Institute; RECs: Research ethics committees

Acknowledgements

Not applicable

Declarations

Our study was totally designed by the authors including the method of study, the questionnaire, and also the intervention education material lectures and booklet which were formulated by the authors.

Authors' contributions

SW collected, analyzed, and interpreted the study data and contributed to the manuscript writing. AR and MF contributed to the manuscript writing. SE and HM contributed to the manuscript writing and supervision of the intervention study. SE and LD were the major contributors to the manuscript writing and revising. All authors read and approved the final manuscript.

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Availability of data and materials

The dataset of the current study is available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The research ethics review committee of National Liver Institute Menoufia University (IRB00003413) approved the study regarding confidentiality and the written consent with approval number (000169). The researcher introduced herself to the participants in the sample and explained the objectives of the study to obtain their acceptance to be recruited in the study as well as to gain their cooperation by applying the consent form before the questionnaire.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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