Nanotechnological Knowledge Levels of Students in the Department of Medical Services and Techniques

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Abstract
Today, nanotechnology is used in many industries such as medicine, chemistry and textile. Developments in science and technology in the 21st century put as much complexity on the part of individuals, as well as professions, institutions and societies, and change life in a social, cultural, economic, and political way.
The purpose of this study is to determine the knowledge levels of students in the Department of Medical Services and Techniques about nanotechnology and to determine the factors affecting this knowledge level.
The use of nanotechnology devices or products that are frequently encountered in clinical practice has raised the need to increase the level of relevant knowledge of students in the Department of Medical Services and Techniques.
In the study, it was determined that only one out of every ten people had knowledge of the subject, while the other four had no knowledge. It has been determined that the level of nanotechnology knowledge in health fields is sufficient only in the treatment of cancer. It has been determined that the education level of the mother and use of the internet for scientific purposes are effective in increasing the level of knowledge. For this reason, in health-related professions that include technology, education must be maintained as parallel with technology and it is necessary to learn what areas and for what purpose nanotechnology is used in health, which risks it brings with its use, and to be aware of the risks.

KeyWords: Nanotechnology; Students; Knowledgement, Health

1. Introduction

The term "nanotechnology" was first defined by Tokyo Science University, Norio Taniguchi in a 1974 paper as follows: "'Nano-technology' mainly consists of the processing of, separation, consolidation, and deformation of materials by one atom or one molecule. Nanotechnology and nanoscience got a boost in the early 1980s with two major developments: the birth of cluster science and the invention of the scanning tunneling microscope (STM). This development led to the discovery of fullerenes in 1985 (Taniguchi, 1974).Nanotechnology is defined as the study of nanoparticles, which are of atomic and molecular size and their application in various diverse fields of science and technology.
In the past few years, the interest in nanoscale science or nanoscience has shown an exponential increase. Nanoscienc e relates to the study of properties, phenomena and the response of materials at the submicron range. Below a certain length scale, a system behaves differently; and the ability to predict that behavior by extrapolating large to small is lost. In the nanoscale, properties of matter have been found to be very

different from those of micro or macroscale. Quantum effects play a very important role in the nano range due to the high surface to volume ratio when compared to large particles (Karunaratne, 2007). With the discovery of the DNA double helix in the mid 20th century, molecular biology became the emerging science by the end of the century. The marriage of biotechnology with nanotechnology opened wider horizons and the quest for intelligent nanodevices gave new life to development in the area of nanomedicine. Advanced diagnostics, nanobiosensors, smart drugs and delivery systems are all a result of these improved molecular Technologies (Logothetidis, 2006).

Information and communication technologies in the world inevitably develop rapidly, these developments affect the provision of health care services in particular. Today, nanotechnology is used in many sectors such as medicine, chemistry, textiles. These systems, which will be further perfected in the future, will have the potential to enter the field of human health and make the kind of dreams we see in science fiction films. 21. the developments in science and technology in the 20th century put professions, institutions, societies in a complex environment to exist and change life in social, cultural, economic or even political terms. These changes continuously affect individual and professional members in the dynamics of change, he has to learn to live with change (Kubic et al. 2005; Freitas, 2006; Rawat et al. 2006; Wang et al. 2005; Curtis, Wilkinson, 2001; Kaya, Bodur, 2015). The use of nanotechnology in the field of Health varies considerably (Vural, 2007). These fields: Diagnosis, Pharmacology, Microbiology, Dental Health, Cancer Treatment, Tissue Engineering, Disinfection and Sterilization (Sahoo et al. 2007; Bangham et al. 1965; Langer, Folkman, 1976; Gref et al. 1995; Bruchez et al. 1998; Chan, Nie, 1998; Cui et al. 2001; Samuel et al. 2002).

Nanotechnology applications require a multidisciplinary approach and almost every field of application is influenced by nanotechnology. It is also emphasized that the use of nanotechnology will increase the global market steadily and that the application of this concept requires joint work in all scientific and engineering fields. In the next few years, the Nanotechnology will be able to develop süper computers on a nano scale, find and heal diseased tissue inside the human body, operate nanostructures, strengthen the capacity of the human brain with the capacity of nano memory, and prevent pollution in nanoparticles will pollute the environment much less because of factories.

Nanotechnology and nanomaterials are known to bring some risks to the science world as well as the advantages they offer. In the literature, the potential advantages of nanotechnology as well as the dangers that will be created will have the same importance and magnitude emphasized (Wolbring, 2007). It is reported that nanoparticles, which are taken into the body through respiration, nutrition and skin and which can easily be absorbed into the blood, affect many organs in the body and cause various diseases (Gök, Özdemir, 2015). Again, it is emphasized that nanotechnological products have negative effects on humans due to their molecular properties (Berk, Akkurt, 2012). Since the risks of nanotechnology and nanoscience are not fully investigated, there has not yet been sufficient and comprehensive regulation for these risks. Since nanotechnology is a very new field, the potential advantages of nanotechnology products have become visible in everyday life and potential risks and losses have not yet emerged. It is important to make regulations and analyze potential losses (Özer, 2008). The importance of nanotechnology in health field, especially in the early definition and treatment of cancer, in clinics, prevention of infection, Wound Care and healing of nanotechnology products are used.

In this study, it is aimed to determine the nanotechnological knowledge levels of the students of the medical services and techniques department of nanotechnology, which is increasingly used in the field of health, and to determine the factors affecting this knowledge level.

1.1 . Material and Method

1.1.1 Universe and sample selection

Sample selection was not made in the research. The study included 420 students who were in the school at the time of the study and who volunteered to participate in the study. “Do you think you know about nanotechnology? those who answered ” Yes “in the answer to the question have knowledge of nanotechnology,” partly and I have no idea/I do not know “choices are considered to have knowledge of nanotechnology. The aim of the study is to provide the students with the knowledge of the class, gender, education level of parents, income level of parents, internet usage time and objectives, nanotechnology information sources, usage areas, development of nanotechnology in health fields and usage risks of nanotechnology products, the responsibilities of the students in the use of nanotechnology products have constituted the independent variables. Among the data collection dates of the study, the students who were not in school could not be evaluated.

1.1.2. Data collection tools

Data were obtained with the help of a questionnaire developed by researchers in accordance with the literature. The questionnaire consists of 32 questions. The first part of the questionnaire consists of questions designed to determine the socio-demographic characteristics of the students and the second part consists of questions aimed at determining the level of knowledge in nanotechnology. The data of the research were applied face to face interviews in the classrooms at the beginning of the course hours.

1.1.3. Data Analysis

During the analysis phase, descriptive statistics were used for numbers, percentages and averages. For a single-variable risk analysis, the Chi-square test was used, and logistic regression models were created for variables that were meaningful during the multivariate risk analysis phase. The results of the regression analysis with binary logistic were evaluated according to p value and beta coefficient (3). The results of the regression analysis with Binary logistic were evaluated according to p value and beta coefficient (3). Data were analyzed in SPSS 22.0 statistical package program. $P<0.05$ was considered significant.

2. Findings and Discussion

It was determined that 70.47% of the research group consisted of female students and 64.52% of the research group consisted of first grade students. It was determined that 33.80% of the students received education at the primary and lower levels of the mother and 27.61% of them received education at the Father's primary and lower levels and 83.80% of them paid their income. It was determined that 53.09% of the participants used the internet for 3 hours a day and less, and that they used the internet for the purpose of joining the most social networks (85.71%) (Table 1).

Table 1. Distribution of socio-demographic characteristics of students

	n	%
Gender		
Woman	296	70.47
Man	124	29.52
Class		
l.Class	271	64.52
2.Class	149	35.47
Mother education status		
Elementary school	142	33.80
Middle school and high school	247	58.80
University and higher	31	7.38
Father education status		
Elementary school	116	27.61
Middle school and high school	256	60.95
University and higher	48	11.42
Family income		
Pays for income	352	83.80
Income does not cover expenses	68	16.19
Internet time used in one day		
<3 hours	223	53.09
4-6 hours	131	31.19
> More than 6 hours	66	15.71
*** Internet usage purpose**		
Join social networks	360	85.71
Doing homework from school	155	36.90
Reading Internet Newspapers	141	33.57
Playing internet games	118	28.09
Following the world of Science	96	22.85
Other, please specify (shop, claim)	23	5.47

Table 2. Distribution of students' responses to the concept of nanotechnology

	n	%
Students who have knowledge about nanotechnology		
Yes	44	10.47
Partially	212	50.47
I don't know.	164	39.04
***Nanotechnology information resources**		
From the internet	226	53.80
Paper, paperboard, etc.	129	30.71
Newspapers	68	16.19
From scientific journals	64	15.23
Articles, scientific articles such as compilation	33	7.85
Activities such as a panel on nanotechnology, conferences, etc.	16	3.80
Lessons	42	10.00
I don't know.	144	34.28
*** Understood from the concept of nanotechnology**		
A science that changes substances atomically and gives new functionality	162	38.57
A science that provides atomic, molecular control of matter	147	36.75
Science in trying to understand substances	94	22.38
I don't know	13	3.09
*** Application areas of nanotechnology**		
Medical and health sector	230	54.76
Materials and manufacturing industry	153	36.42
Aviation and aerospace studies	146	34.76
Environment and energy sector	139	33.09
I don't know	48	11.42

Table 3. Distribution of responses to the use of nanotechnology in healthcare

*** Development of nanotechnology in surgical field**		
Prosthesis	141	33.57
Cardiac-vascular system implants	132	31.42
Artificial organ works	118	28.09
Catheters	83	19.76
Neural implants (brain-spinal cord-nerves)	84	20.00
Ophthalmic materials	75	17.85
I don't know.	204	48.57
*** Development of nanotechnology in pharmaceutical production studies**		
Less damage to healthy tissues.	105	25.00
Very small size.	102	24.28
They pass through the blood-brain barrier or cell membrane very easily.	101	24.04
It directly affects the tissues.	72	17.14
I don't know.	214	50.95
The development of nanotechnology in cancer diagnosis and treatment		
Breast cancer is a disease in which malignant (cancer) cells form in the tissues of the breast.	144	34.28
*** Development of nanotechnology in diabetes treatment**		
Making nanotechnological devices for control of blood sugar of patients	105	25.00
Studies on the implementation of subcutaneous insulin	104	24.76
Blood glucose control with Nano products given to the body via respiration	66	15.71
I don't know.	251	59.76

While only 10.47% of the research group had knowledge of nanotechnology, half (50.47%) of the research group reported that it had knowledge in part, and 39.04% reported that it had no knowledge. Those who have full or partial knowledge expressed that they have learned this information at most via the internet (53.80%) and only 10.0% of them have learned this information from the courses. The concept of nanotechnology, 38.57% of the students in the eyes of the materials atomic change, creating new functionality reminiscent of Science and other sectors in the medical and health sector than the use of nanotechnology expressed 54.76% (Table 2).

47.38% of the students stated that nanotechnology was used in the field of health and 16.19% was partially used and 1.19% was not used at all, and 31.66% had no idea on the subject. It was determined that the research group had more knowledge of the cellular approach to cardiovascular diseases in nanotechnology treatment methods (27.85%) and that they knew that nanotechnology drugs had both local and systemic effects on the human body (27.85%). The students reported the use of nanotechnology methods in the most surgical fields (52.38%), nanotechnology drug production (50.00%) and cancer treatment (47.85%). In the surgical field, the most developed in the production of prosthesis (33.57%), drug production studies of nanoparticles less damage to healthy tissues (25.00%) they know. Screening for breast cancer in the diagnosis and treatment of cancer, with fewer cells in the presence of nanotechnological diagnostic tools it is possible to put the diagnosis of information (%34.28), Wound Care and healing will be shortened as the duration of treatment of information (%26,66), new methods for the determination of the causes of diseases in the field of clinical Microbiology was developed in the information technological knowledge of the construction of nano-devices for blood sugar control diabetes patients (%25.00) other variables as is known has been identified according to the categories further. In the responses to questions involving the use of nanotechnology in health fields, it was observed that the rates of those who do not have or do not have an idea on the subject ranged from 31.66-59.76% (Table 3).

Table 4. Distribution of students' responses to nanotechnology usage risks related to knowledge level in health care

	n	**%**
The risks of nanotechnology in the field of Health		
Yes	135	32.14
Partially	208	42.52
None	43	10.23
I don't know	323	76.90
*** Use risks of nanotechnology in the field of Health**		
Nanotechnological products have toxic effects due to their molecular properties.	169	40.23
It can lead to sudden death because they are very fast in systemic circulation.	145	34.52
Toxic effect due to nano-particles entering the human body through the easiest breathing.	403	95.95
I don't know	160	38.09

32.14% of the research group reported that there was a risk of use of nanotechnology in the field of health and 10.23% reported that there was no risk and 76.90% stated that there was no idea. They reported that the use risks of nanotechnology in the field of Health could have a toxic effect (40.23%) due to the molecular properties of nanotechnology products. 38.09% of the students had no idea/knowledge about the risks of nanotechnology use. A significant correlation was found between the nanotechnology knowledge level and maternal education level of the students in the single variable risk analysis ($p=0.004$). The statistical difference between the students with internet usage purpose ($p=0.036$) and the students with science world ($p=0.000$) was determined statistically.

There was a statistically significant correlation between the use of nanotechnology in health care and osteoporosis treatment ($p=0.000$), diabetes treatment ($p=0.000$), cancer treatment ($p=0.000$), Wound Care and healing ($p=0.000$), infection prevention ($p=0.000$), pain management ($p=0.003$). In addition, there was a significant difference between those who know that nanotechnology is used in the field of

health and the knowledge of nanotechnology risks in health (p=0.045). There was no statistically significant difference between the age, gender, father education level, income level of the family, internet usage time, use of the internet social networks, use of the internet for playing games and nanotechnology knowledge level (p>0.05).

Nanotechnology, which is used in many fields such as Engineering, Physics, Chemistry and Biology, has taken its place in health and medicine today and has started to develop and use in multidisciplinary approach. The students of the Department of Medical Services and Techniques of the use of nanotechnological devices or products commonly encountered in clinical applications have also demonstrated the necessity of increasing the level of knowledge on the subject.

In our study, it was found that the nanotechnology knowledge levels of the students were significantly influenced by their mother's education level. It was determined that the level of nanotechnology knowledge was increasing in the student's education of their mothers starting from primary school and lower levels towards University and higher education. It is emphasized that, as the mother education level increases, the children's curiosity, empathic and critical thinking ability, communication skills, language development and school achievement increase together with the studies carried out. This finding is in parallel with the literature, and it is thought that the positive effect of the increase in the education level of the mother on curiosity is foreground and the nanotechnology is learned without worry (Tümkaya, Aybek, 2008; Bingöl, Demir, 2011). In our study, there was no significant difference between the students ' nanotechnology knowledge level and father education level. Today, despite the change in gender roles, gender division in our country, the effect of the gender role given to the Father is still observed. It is observed that the Mother spends more time with her children, especially parents with high levels of maternal education, while the Father's relationship with the child is limited due to these roles and the parents ' individual contribution to the education of their children is low (Dündar, 2012; Kılıç, 2013). It was thought that the students' nanotechnology knowledge level had a positive effect on the mother and the absence of a positive effect on the father could be due to the effect of the gender roles given to the parents. In our study, the level of nanotechnology knowledge did not create gender differences. This is due to the fact that both sexes have encountered the same nanotechnology applications in educational and clinical applications. There was no statistically significant difference between the level of nanotechnology knowledge and the income status of the research group. In our study, it was determined that the duration of Internet use was up to 1-3 hours and that there was no significant correlation between the level of nanotechnology knowledge. While determining a meaningful relationship between the nanotechnology level of the students who use the internet in order to read the paper, it was determined that the nanotechnology level of the students who use the internet in order to follow the science world yielded significant results in both analyses. Because of the use of social networking and games in popular culture, spending a long time on the internet is a disadvantage in having qualified knowledge. It shows that the students who use the internet for the purpose of following the world of science can have a high interest in related fields and that individuals with a high researcher role are more likely to encounter the concept of nanotechnology.

3. Conclusions And Recommendations

In our study, it was found that the knowledge of nanotechnology in the field of cancer treatment of the students was significantly higher. It is inevitable to benefit from nanotechnology in the early diagnosis and treatment of cancer, which ranks first among both global disease and causes of global mortality and is a major contributor to health expenditures. It has been observed that the scientific developments in cancer and the new technologies which are on the agenda of the written and visual media are very frequent in the students' knowledge level. In our research, the answers to questions involving the use of nanotechnology in health fields have been shown to vary between 31.66% and 59.76% of those who do not or do not have an idea on the subject. In this respect, it is thought that the results of the student who does not have any sense of the subject may be affected by this situation, as there will be no curiosity to investigate the information. The fact that the concept of nanotechnology is not included in the curriculum is a disadvantage, but it is thought that it is insufficient to obtain some information during the research carried out by the students for the homework given in the lessons. It is estimated that this information is learned through sources such as non-curricular TV-Internet.

The level of nanotechnology knowledge in health fields has been determined to be sufficient for cancer treatment only. It was determined that maternal education and Internet use for scientific purposes were effective in increasing the level of knowledge. It is thought that the development and application of nanotechnology in the field of health is not sufficient for their profession to learn mostly through written and visual media and internet, and this situation can increase the risks in clinical applications. For this reason, it is recommended to continue education in health related professions that include technology in

parallel with technology, to learn what areas and purposes Nanotechnology is being used in health, to learn which risks it brings with it and to add lessons in nanotechnology and nanootechnology in order to gain awareness about the risks.

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