



# **Knowledge and Awareness on Personalized Medicine amongst Health Care Specialists and University Students in Health Colleges in Saudi Arabia**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author NJA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors ASA and FZA managed the analyses of the study. Author NJA managed the literature searches. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Aim:** There are a few studies about the populations' knowledge and perceptions on personalized medicine in Saudi Arabia until now. Therefore, the aim of this study was to assess the knowledge and awareness on personalized medicine amongst health care specialists and university students in health colleges in Saudi Arabia.

**Methodology:** This is a cross-sectional study that include a survey targeting health care specialists. The survey translated to Arabic and after validation, it was converted to an online survey using google forms.

**Results:** About 52.34% of the participants have heard about different terms regarding personalized medicine (personalized medicine, healthcare reform, individualized care and pharmacogenomics).

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Most of the health care specialists in the present study said that they have poor knowledge about personalized medicine (68.75%). Most of the participants in the present study were interested to learn about personalized medicine and showed a positive attitude about it.

**Conclusion:** The present study found that health care specialists had a poor knowledge about personalized medicine but they are interested to learn more about this field. Therefore, more training and awareness programs about personalized medicine are needed to facilitate its introduction in Saudi Arabia. Moreover, more focus on this field should be introduced into the health colleges' curricula.

*Keywords: Awareness; healthcare specialists; knowledge; personalized medicine.*

## 1. INTRODUCTION

Personalized medicine is a medical model that aims to provide tailor-made prevention and treatment strategies for defined groups of individuals. The European Health Ministers defined personalized medicine as: A medical model using characterization of individuals' phenotypes and genotypes (e.g. molecular profiling, medical imaging, lifestyle data) for tailoring the right therapeutic strategy for the right person at the right time, and/or to determine the predisposition to disease and/or to deliver timely and targeted prevention [1].

Personalized medicine refers to the evolving discipline that combines clinical data with genetic and environmental data in order to provide optimal healthcare services based on the appropriate diagnosis and treatment per the needs of each patient. It relies greatly on the genetic sequencing of patients and compares them with their clinical data to draw an assumption about future prognosis [2-7]. In fact, the field has grown intensely in the previous years to include other diagnostically important parts such as the use of genomic biomarkers in expecting the future risks on health [7-10].

Personalized medicine is important to support the management and prevention of diseases and to deliver cost-effective, optimal and targeted healthcare and as a result achieving better outcomes [10-12]. Personalized medicine is considered a relatively new discipline nevertheless growing evidence is supporting the implementation of it nowadays [13,14]. Several studies reported that personalized medicine produced a significant decrease in the burden of numerous diseases. For example, it caused a 34% reduction in chemotherapy administration in females suffering from breast cancer [15,16]. Furthermore, it is also thought that personalized medicine prevent up thousands

of strokes annually if a genetic test was conducted before the beginning of treatment [15,17].

As the discipline is developing rapidly and contributing to vital improvements in both diseases' diagnostics and management, national efforts were carried out by the Saudi Human Genome Project to put the basis of genomic research and to operationalize the evidence-based personalized medicine in Saudi Arabia [18]. However, these arrangements must be supported by the national surveys that measure the willingness of local populations for this discipline [19].

There are a few studies about the populations' knowledge and perceptions on personalized medicine in Saudi Arabia until now. Therefore, the aim of this study was to assess the knowledge and awareness on personalized medicine amongst health care specialists and university students in the health colleges in Saudi Arabia.

## 2. METHODOLOGY

This is a cross-sectional study that includes a survey targeting health care specialists and university students who studied in health colleges in different cities in Saudi Arabia. The survey was adapted from a previous study [19]. The survey translated to Arabic and after validation, it was converted to an online survey using google forms. It was distributed to be filled by health care specialists using WhatsApp and Instagram.

The survey includes 3 main parts: personal data of health care specialists, health care specialists' knowledge about personalized medicine and their familiarity with it and health care specialists' perception and their interest levels to learn about personalized medicine.

The survey includes health care specialist and the students in the health colleges. So workers or students in non-health specialties were excluded. Additionally, all incomplete surveys were also excluded. The data were collected using Excel sheet and represented by frequencies and percentages. Some questions could be answered by more than 1 choice so the total percentages for some questions could be more than 100%.

### 3. RESULTS AND DISCUSSION

The survey was filled by 64 respondents. More than 68 % of them were females and the age of about 56.25 % of them was between 20-29. The specialty of about 59 % of the participants was medicine, nursing or pharmacy. Personal data of health care specialists are shown in Table 1.

Only 45.31 % of the participant said that they have heard the term personalized medicine, 54.69 % have heard the term healthcare reform, 53.13 % have heard the term individualized care and 56.25 % of them have heard about Pharmacogenomics term. Only 31.25 % of the respondents said that they have a good knowledge about personalized medicine. Health care specialists' knowledge about personalized medicine and their familiarity with it are shown in Table 2.

About 52.34 % of the participants have heard about different terms regarding personalized medicine (personalized medicine, healthcare reform, individualized care and pharmacogenomics). Similarly, Altayyari et al. stated that in their study, about 60.70% of the respondent have heard of these terms [19]. Lee

et al. reported that only 28.4% of the respondents were Fully aware of personalized medicine [20].

Most of the health care specialists in the present study said that they have poor knowledge about personalized medicine (68.75%). Similarly, Altayyari et al. reported that only 7.9% of the respondents scored their level of knowledge about personalized medicine at "extremely knowledgeable" and only 12.20% scored their level of knowledge about personalized medicine at "moderately knowledgeable" [19].

About 76.56% of the participants said that they are interested to learn about personalized medicine and about 89.06 % of them said that they would like to know if they at high risk of developing chronic diseases. Additionally, 60.94 % of the respondents reported that they are interested in undertaking a genetic test.

The most important value of personalized medicine was Minimizing the impact of diseases through preventive medicine (46.87%) followed by *tailoring treatment and* predicting whether a medication is likely to help or hurt me before I ever take it (31.25%). In contrast to that, Altayyari reported that almost 35.2% of the students considered 'predicting what disease they may get in the future' as the most valuable benefit to them [19]. The majority of the respondents said that they don't take any education or training about personalized medicine (89.06%) and about 87.50 % of them think that all health students should take a course about personalized medicine in their university teaching.

**Table 1. Personal data of health care specialists**

Variable	Category	Number	Percentage
Gender	Male	20	31.25%
	Female	44	68.75%
Age	Less than 20	19	29.69%
	20-29	36	56.25%
	30-39	8	12.50%
	More than 39	1	1.56%
Specialty	Medicine	18	28.13%
	Pharmacy	10	15.63%
	Nursing	10	15.63%
	Other specialties	26	40.63%
Nationality	Saudi	28	43.75%
	Non-Saudi	36	56.25%
Marital status	Single	56	87.50%
	Married	8	12.50%

**Table 2. Health care specialists' knowledge about personalized medicine and their familiarity with it**

Variable	Category	Number	Percentage
Have you ever heard of Personalized medicine term	Yes, I have heard of this term	29	45.31%
	No, I have never heard of this term	33	51.56%
	I don't want to answer	2	3.13%
Have you ever heard of Healthcare reform term	Yes, I have heard of this term	35	54.69%
	No, I have never heard of this term	29	45.31%
	I don't want to answer	0	0.00%
Have you ever heard of Individualized care term	Yes, I have heard of this term	34	53.13%
	No, I have never heard of this term	28	43.75%
	I don't want to answer	2	3.12%
Have you ever heard of Pharmacogenomics term	Yes, I have heard of this term	36	56.25%
	No, I have never heard of this term	28	43.75%
	I don't want to answer	0	0.00%
Rank yourself based on your perceived knowledge level about Personalized Medicine	I don't want to answer	1	1.56%
	Not at all knowledgeable	24	37.50%
	Can't score my knowledge level	10	15.63%
	Only minimally knowledgeable	9	14.06%
	Moderately knowledgeable	15	23.44%
	Extremely knowledgeable	5	7.81%

Most of the health care specialists (65.63%) said that it is important to learn more about all issues around personalized medicine (Basic information, Costs, Successful is this approach, General Availability, Ethical implications). Health care specialists' perception and interest levels to learn about personalized medicine are shown in Table 3.

Most of the participants in the present study were interested to learn about personalized medicine and showed a positive attitude about it. Similarly, Altayyari et al. stated that 63.10 % of the students in their study were interested to learn about personalized medicine [19]. Lee et al. reported that about 89.6% of the participants in their study showed a positive attitude towards personalized medicine [20]. Additionally, similar to the results of the present study, Altemani reported that the unsatisfactory degree of personalized medicine knowledge was observed

in 87.50% of primary care physicians, while, favorable attitudes (51.39%) and good enthusiasm (70.84%) have been detected among them [21].

Around 87.50% of the respondent said that all health students should take a course about personalized medicine in their university teaching. Similar to this result, Altayyari et al. reported that about 81.8% of students were interested in attending grand rounds focusing mainly on personalized medicine [19].

In the present study, most of the respondents said that all issues around personalized medicine are important. Altayyari et al. reported that 'basic information including definitions, tools and benefits' was the most preferred choice (29.4%), followed by 'how successful is this approach' (23%) [19].

**Table 3. Health care specialists' perception and interest levels to learn about personalized medicine**

Variable	Category	Number	Percentage
Are you interested to learn about personalized medicine?	Not interested at all	3	4.69%
	I am not sure	2	3.12%
	Only minimally interested	10	15.63%
	Moderately interested	18	28.12%
	Extremely interested	31	48.44%

Variable	Category	Number	Percentage
Would you like to know if you are at high risk of developing Alzheimer's disease, cancer, diabetes, heart disease and/or other chronic diseases based on genetic sequencing.	Yes, I would like to know if I am at high risk of developing these diseases	57	89.06%
	No, they don't want to know	7	10.94%
If you don't want to know if you are at high risk of developing chronic diseases, what are the reasons behind that	I fear to know what potential diseases were ahead of me	7 (Out of7)	100.00%
	I am concerned about privacy issues	1 (Out of7)	14.29%
	I am concerned about other ethical issues	1 (Out of7)	14.29%
Are you interested in undertaking a genetic test?	I am not sure	5	7.81%
	Not interested at all	9	14.06%
	Only minimally interested	11	17.19%
	Moderately interested	11	17.19%
	Extremely interested	28	43.75%
Amongst these, what is the most important value of personalized medicine?	Predicting what diseases I may get in future	14	21.87%
	Minimizing the impact of diseases through preventive medicine	30	46.87%
	Once diagnosed with a disease, tailor treatments, predicting whether a medication is likely to help or hurt me before I ever take it.	20	31.25%
Do you take any education or training about personalized medicine?	Yes	7	10.94%
	No	57	89.06%
Do you think that all health students take a course about personalized medicine in their university teaching?	Yes	56	87.50%
	No	8	12.50%
Issues around personalized medicine to learn more about.	Basic information	10	15.62%
	Successful is this approach	7	10.94%
	Costs	1	1.56%
	General Availability	0	0.00%
	Ethical implications	1	1.56%
	All important	42	65.63%
	Not interested	3	4.69%

#### 4. CONCLUSION

The present study found that health care specialists had a poor knowledge about personalized medicine but they have a positive attitude towards it, besides they are interested to learn more about this field. Therefore, more training and awareness programs about personalized medicine are needed to increase the awareness of health care providers about personalized medicine and to facilitate its introduction in Saudi Arabia. Moreover, more focus on this field

should be introduced into the health colleges' curricula.

#### DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by

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## CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

It is not applicable.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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