

Knowledge, Attitudes and Willingness to Practice of Personalized Medicine among Primary Health Care Physicians in Kafr el-Sheikh Governorate in Egypt

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Abstract: Introduction: Personalized Medicine (PM) has been developed as an approach to disease treatment and prevention that seeks to maximize effectiveness by taking into account individual variability in genes, environment, and lifestyle. It has the ability to classify individuals into subpopulations that differ in their susceptibility to a particular disease or their response to a specific treatment. This perceptible will lead to more accurate diagnoses, more rational disease prevention strategies, better treatment selection, and the development of novel therapies. The widespread practice of PM requires efficient and competent primary health care physicians to deliver it with high quality based on their up-to-date knowledge, favorable attitudes and enthusiasm. **Objectives:** The study aimed to assess the degree of knowledge, extent of favorable attitudes and willingness to practice PM of primary health care physicians in Kafr el-Sheikh Governorate in Egypt. **Methods:** A cross-sectional analytical design was used to recruit 115 1ry health care physicians from 3 different districts chosen by the stratified random sampling technique in Kafr el-Sheikh Governorate in Egypt. The subjects were requested to complete a structured self-administered questionnaire. The questionnaire was designed and pretested to assess the relevant PM knowledge, attitudes and willingness of physicians regarding PM practice. The simple scoring system was used for knowledge assessment. Likert scale was used to measure the extent of attitudes towards PM. Assessment of willing to practice degree based on the use of forced-choice response scale (yes or no). Sufficient statistical analysis was done. The data was analyzed by using the Statistical Package for Social Sciences (SPSS) version 21. The level of statistical significance was set at $P < 0.05$. **Results:** All of the studied physicians (100%) did not receive any training on PM and/or genomic medicine. Their main source of knowledge (76%) was the internet. Unsatisfactory degree of PM knowledge was observed in 91.3% of them, while good favorable attitudes (14.4%) and willingness to PM practice (30.8%) have been detected among the studied physicians. **Conclusion:** Unfortunately the actual PM knowledge was deficient among primary health care physicians. Emphasizing on essential PM knowledge in basic and continuing medical education should be given a high priority. Meanwhile, realizing the favorable attitudes and good willingness of physicians towards the great potential of PM in quality improvement of patient's care are promising.

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Key Words: Personalized Medicine, Precision Medicine, Genomics, KAP Studies.

1. Introduction

Personalized Medicine (PM) is a new philosophy in the health care. It consists of the application of innovative diagnostic methods and biotechnologies to the prediction of human pathologies and in the development of prevention and individual therapy-planning⁽¹⁾. The concept of PM is not new: clinicians have long observed that patients with similar symptoms may have different illnesses, with different causes; and similarly, that medical interventions may work well in some patients with a disease but not in others with apparently the same disease. The fraction of patients who respond positively to their medications is approximately ranging from 25 to 60% only, therefore the remaining fraction is not receiving the proper medication or is suffering from significant therapeutic problems, such as delays by substituting

from one medication to another until good prognosis is achieved⁽²⁾. PM includes prevention and treatment strategies that take individual variability into account. PM is a bold approach that broadly integrates the endeavors and advances of biomedical science, physical science, and engineering research with health outcomes and health care⁽³⁾. What is new is that advances in a wide range of fields from genomics to medical imaging to regenerative medicine, along with increased computational power and the advent of mobile and wireless capability and other technologies, are allowing patients to be treated and monitored more precisely and effectively and in ways that better meet their individual needs⁽⁴⁾.

A few studies have assessed the adoption of genetic testing and its impact on the role and practice of physicians⁽⁵⁻⁹⁾. They focused primarily on the

adoption of genetic tests for the diagnosis and treatment of cancer, and recommended physician education, public education and improved coordination of healthcare delivery and genetic testing services. In order to facilitate medical and continuing professional education in PM, it is essential to have a baseline understanding of current knowledge, attitudes and practice (KAP) ⁽¹⁰⁾. KAP studies are widely used to gather information for planning of health programs¹¹ and they are adequately efficient due to their pertinent characteristics of easy design, quantifiable data, simplicity of interpretation and concise presentation of results, generalizability of small sample results to a wider population, cross-cultural comparability, and speed of implementation ⁽¹¹⁻¹²⁾. Also, the collected data enable health managers to set priorities, to estimate resources required for various activities, to select the most effective communication channels and messages, to establish baseline levels, and for advocacy ⁽¹³⁾.

Study Objectives

The study aimed to assess the degree of knowledge, extent of favorable attitudes, and willing to practice PM of primary health care physicians in Kafr el-Sheikh Governorate in Egypt.

2. Material and Methods

Research Setting:

The study was conducted in Kafrel-Sheikh Governorate in Egypt.

Targeted population:

Physicians working in rural and urban PHC centers in Kafr el-Sheikh Governorate in Egypt.

Study Design:

A cross-sectional analytical design was utilized to recruit a representative sample of physicians from 3 different districts in Kafr el-Sheikh Governorate in Egypt. The studied subjects (physicians) were requested to complete a self-administered structured questionnaire. The questionnaire was designed to adequately assess the pertinent PM variables as related to primary health care practice. The independent (health facility, age, sex, highest qualification, source of PM knowledge, work experience years and PM and/or genomic training) and 3 principal dependent variables (knowledge, attitudes and willing to practice) were chosen and revised by 5 community medicine experts. The simple scoring system was used for knowledge assessment (fixed choice 10 questions with correct or incorrect answer). Likert scale was used to measure the extent of attitudes towards PM by defining the focus of 10 statements and rating them on a 0-to-2 response scale as following: 0 for disagreement, 1 for undecided and 2 for agreement on each present statement. The final score for the respondent on the scale is the sum of their ratings for

all of the items i.e. summated scale. Regarding to the assessment of willing to practice degree, it was based on the use of forced-choice response scale (yes or no). Sufficient statistical analysis was done. The data was analyzed by using the Statistical Package for Social Sciences (SPSS) version 21. The level of statistical significance was set at $P < 0.05$.

Pretest Study:

It was carried out during the preparatory research phase (1st. 2 months). A preliminary questionnaire was generated and tested to assess the validity, reliability, applicability, timing, or any needed modifications to reach the final accepted form (The pilot group was excluded from data analysis).

Sampling Technique:

The multi-stage random sampling technique was utilized to recruit the required physicians. At the first stage 3 districts from Kafr el-Sheikh Governorate were randomly chosen by the simple random sampling technique. During the second stage, 10 primary health care centers were chosen by the stratified random sampling technique from each sub-directorate. At the third stage, physicians were chosen by the systematic random sample technique.

Analysis of data:

Data was categorized and analyzed using Statistical Package for Social Sciences version 21 (SPSS Inc., Chicago, IL). Quantitative variables were described by means and standard deviations, and qualitative variables by frequency distributions and percentages. Chi-squared test was used to determine the associations between factors and t-test for testing the significant difference between quantitative variables. A $p\text{-value} < 0.05$ was considered statistically significant.

Ethical Considerations:

The ethical approval for conducting of this study was provided by directorate of health affairs in Kafr el-Sheikh governorate. Further, all of the study participants were informed that their names or any identification leading to them were kept purpose of the study and their right to refuse to answer any question or withdraw from the study at any time. They were informed that there is no "correct" or "incorrect" answer and they were requested to express their opinions and thoughts freely. The collected information was strictly confidential.

3. Results:

Response rate:

One hundred and fifteen questionnaires were distributed among the primary healthcare physicians and 104 responded (90.4 % overall response rate). A total number of (11) physicians refused to participate in the study either due to being busy or showed no interest in the subject were excluded. Thus, the

respondent group retained for the analysis comprised (104) active physicians with an adjusted response rate of 90.4%. Of the respondents, 45.2% and 54.8% were

males and females, respectively, as shown in Table (1) with an average age and experience years of 28.79 ± 3.161 and 3.60 ± 3.022 , respectively.

Table (1): General Characteristics of the Studied Physicians

Character	Health Facility						Total (N.104)	
	Rural health unit (N.27)		Urban health unit (N.15)		Family unit (N.62)			
	No.	%	No.	%	No.	%	No.	%
Age (years):								
≤28	27	100	3	20	36	58.1	66	100
>28	-	-	12	80	26	41.9	38	100
Mean± SD	26.44±.506		32.40±3.397		28.94±2.908		28.79±3.161	
Significance	$f=25.496, P=0.000$							
Sex:								
Males	12	44.4	3	20	32	51.6	47	45.2
Females	15	55.6	12	80	30	48.4	57	54.8
Significance	$\chi^2=4.881, P=0.087$							
Occupation:								
Unit director	11	40.7	3	20	17	27.4	31	29.8
Doctor in charge	16	59.3	3	20	26	41.9	45	43.3
Assistant specialist	-	-	7	46.7	15	24.2	22	21.2
Specialist	-	-	2	13.3	4	6.5	6	5.8
Consultant	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-
Significance	$\chi^2=18.877, P=.004$							
Education:								
M.B.B.Ch	27	100	3	20	40	64.5	70	67.3
Diploma	-	-	7	46.7	17	27.4	24	23.1
Master	-	-	5	33.3	5	8.1	10	9.6
Doctorate	-	-	-	-	-	-	-	-
Significance	$\chi^2=31.228, P=.000$							
Experience years:								
≤3	27	100	2	13.3	37	59.7	66	63.5
>3	0	0	13	86.7	25	40.3	38	36.5
Mean± SD	1.44±0.506		7.14±3.348		3.75±2.783		3.60±3.022	
Significance	$f=24.383, P=0.000$							

It's clear from Table (2) all of the studied physicians did not received PM and/or Genomic training and their main source of their Personalized Medicine knowledge (76%) was the internet

Table (2): Personalized Medicine training and source of knowledge of the Studied Physicians

Character	Health Facility						Total (N.104)	
	Rural health unit (N.27)		Urban health unit (N.15)		Family unit (N.62)			
	No.	%	No.	%	No.	%	No.	%
PM⁽¹⁾ and/or Genomic Training:								
Received	-	-	-	-	-	-	-	-
Did not receive	27	100	15	100	58	100	104	100
Source of PM⁽¹⁾ Knowledge:								
Internet	27	100	9	60	43	69.4	79	76
Text books	-	-	5	33.3	10	16.1	15	14.4
Medical journals	-	-	1	6.7	3	4.8	4	3.8
In-service training	-	-	-	-	-	-	-	-
Others	-	-	-	-	6	9.7	6	5.8
Significance	$\chi^2=16.224, P=.013$							

PM⁽¹⁾, Personalized Medicine

It's evident from Table (3) that only 8.7% of respondents have good degree of knowledge regarding to important PM elements. Also, the fair and poor

degrees of knowledge among them were 48.1% and 43.3%, respectively.

Table (3): Assessment of Personalized Medicine Knowledge of the Studied Physicians

Personalized Medicine Knowledge Aspects	Studied Physicians (N. 104)			
	Correct Answer		Incorrect Answer	
	No.	%	No.	%
Definition	19	18.3	85	81.7
Synonymous with PM ⁽¹⁾	12	11.5	92	88.5
P4 medicine	61	58.7	43	41.3
Usefulness	47	45.2	57	54.8
Determinants	57	54.8	47	45.2
Applicability in 1ry health care	51	49.0	53	51.0
Applicability in breast cancer	52	50.0	52	50.0
Applicability in immunization	28	26.9	76	73.1
Difficulties	56	53.8	48	46.2
Required laboratory investigations	25	24.0	79	76.0
Overall Assessment:	No.		%	
Good	9		8.7	
Fair	50		48.1	
Poor	45		43.3	

⁽¹⁾ PM, Personalized Medicine

It's clear from Table (4) that (14.4%) and (82.7%) of respondents have good and fair favorable attitude towards important PM aspects respectively. Also, one may noticed that 40.4%, 48.1% and 40.4%

of them have un-favorable attitude towards medical curricula PM sufficiency, easy patients' PM accessibility and patient acceptance of PM, respectively.

Table (4): Attitudes of the Studied Physicians towards Important Personalized Medicine Aspects

Personalized Medicine Attitude Aspects	Studied Physicians (N.104)					
	Disagree		Uncertain		Agree	
	No.	%	No.	%	No.	%
Future Mapping of PHC	5	4.8	39	37.5	60	57.7
Physicians' Acceptance	17	16.3	51	49.0	36	34.6
Wide Spread Applicability	20	19.2	40	38.5	44	42.3
Needed Research	0	0	20	19.2	84	80.0
Costs High	10	9.6	16	15.4	78	75.0
Importance in Medical Progress	15	14.4	41	39.4	48	46.2
Acceptance by Patients	42	40.4	50	48.1	12	11.5
Physical Accessibility	50	48.1	48	46.2	6	5.8
No Interference with Ethical Consideration	50	48.1	31	29.8	23	22.1
Sufficient for All Medical Curricula	42	40.4	58	55.8	4	3.8
Overall Attitudes Assessment:	No.			%		
Good	15			14.4		
Fair	86			82.7		
Poor	3			2.9		

Table (5) showed that 30.8% and 46.2% of respondents have a good and fair degree of willingness regarding PM practicing, respectively, with 20.2% and

65.4% of them reporting that they will try to organize PM workshop (s) and attend PM conference (s), respectively.

Table (5): Willingness of the Studied Physicians Regarding Personalized Medicine Practice

Personalized Medicine Willingness Aspects	Studied Physicians (N.104)			
	YES		NO	
	No.	%	No.	%
Interested in PM Practicing	72	69.2	32	30.8
Willing to Practice PM	98	94.2	6	5.8
Ready to Learn PM Practicing Principles	84	80.8	20	19.2
Keen to have PM Practicing Degree	7	6.7	97	93.3
Looking for training on PM	73	70.2	31	29.8
Will search for recent PM topics-as needed	74	71.2	30	28.8
Disseminate PM materials on colleagues	63	60.6	41	39.4
Try to organize PM workshop (s)	21	20.2	83	79.8
Try to attend PM conference (s)	68	65.4	36	34.6
Eager to Practice PM	15	14.4	89	85.6
Overall Enthusiasms' Assessment:	No.		%	
Good	32		30.8	
Fair	48		46.2	
Poor	24		23.1	

Finally, Figure (1) showed the Overall assessment of Personalized Medicine Knowledge, attitude and willingness regarding Personalized Medicine Practice.

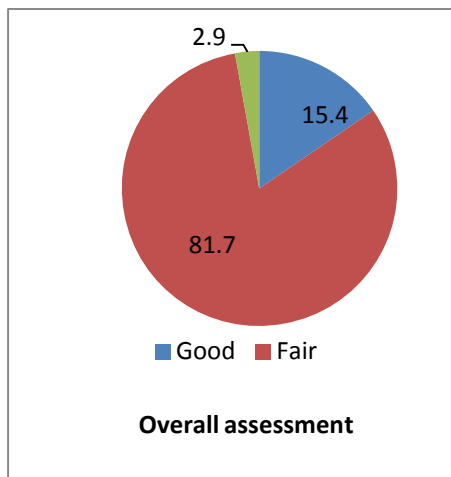


Figure (1): Overall assessment of personalized medicine Knowledge, attitude and willingness to practice Personalized Medicine.

4. Discussion

The researcher has expected that with many advances in PM on the horizon, the PM knowledge of the studied physicians could be satisfactory and increased exponentially. But, the results revealed a significant very low gap in physicians' knowledge about the basic principles of PM (only 8.7% of them have good degree of PM knowledge). This is in agreement with Karlikova M, et al (2014) as they have concluded in their study that the actual knowledge of the principles of personalized medicine among clinicians and therefore their applications are still low

(14). As such, this reveals the urgent need for greater efforts toward physicians' education and dissemination of PM guidelines and training. Another important study of PM in Canada (2011) has addressed the adoption and practice in oncology, cardiology and family medicine showed that most physician respondents are not confident in discussing genetic testing and PM with their patients due to the overall lack of formal education in the field among the surveyed physicians, as well as the limited time and resources available for physicians to study this subject (15). Also, as the future of medicine shall depend on the quality and efficiency of medical students to a great extent, the need for PM integration into current curricula is of great importance. However, PM knowledge alone may not be sufficient to change the medical practice, consequently; there is need to a positive attitude toward PM and other system level factors. Surveys of Canadian (15) and US physicians (16) have reported the need for physician education for the successful adoption of PM. These studies found that a majority of physicians lack the education, training and support necessary for successful adoption. They have demonstrated that current physician knowledge, real-world data and guidelines relating to PM have often been insufficient for appropriate.

Lastly, several studies reported the knowledge and practice gap, lack of formal training and awareness toward PM among current Physicians and health workers (17-21). In all cases, less attention has been paid to future doctors and health workers despite their reported knowledge gap on PM and the related pharmacogenomics (22-23). Launiala (2009) (15) showed that the top five barriers for physicians adoption of PM practice were: lack of clinical practice guidelines, limited provider knowledge, attitudes and awareness

of benefits, lack of evidence-based clinical information, the cost of testing and a lack of time and resources to educate patients⁽¹⁵⁾. As the current study showed low degree of physicians knowledge and moderate degree of favorable attitudes towards PM, thus, we have to emphasize on the importance of the current educational and awareness raising systems for scientists, physicians and other health professionals to adopt new curricula to prepare them for the challenges of personalized medicine. Also, we have to engage and encourage medical students to move in to this new and complex field as endorsed by Paveli et al (2015) and Özgüç (2014)⁽²⁴⁻²⁵⁾. Finally, the research revealed good willingness degree for practicing of PM among the studied physicians and one may consider it is equally important to knowledge and attitudes, as revealed by other investigators e.g. McLaughlin (2012)⁽²⁶⁾ who concluded that willingness of practitioners is one of the key factors that can make or break the energy in the clinic environment. This encouraging finding in the current study is an ideal starting point for pro-active training activities that are likely to gain the target physician's confidence and interest. Such programs should attempt to combine knowledge enhancement with regular competency evaluation for physicians⁽²⁷⁻³⁰⁾.

One may consider that the current study will be very useful as one important baseline source of information for PM practice for future national Egyptian studies on this topic. However, the noticed unfamiliarity of the studied physicians with the topic may have negatively influenced the response rate and results. There may have been differences in respondents based on the type of their health facility i.e. rural or urban health care⁽³¹⁾. All the results were based on physicians' structured self-administered questionnaire in Kafr el-Sheikh Governorate in Egypt.

Conclusion

Endorsing the essential PM knowledge in basic and continuing medical education should be given a high priority. Meanwhile, realizing favorable attitudes and good willingness of primary health care physicians towards the great potential of PM in quality improvement of patient's care are promising and should be endorsed by medical policy makers. What is needed now is a broad research program to encourage creative approaches to PM, test them rigorously, and ultimately use them to build the evidence base needed to guide clinical practice.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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