Research Article   **Open Access**

Knowledge, Awareness and Attitude of Pharmacists toward Pharmacogenetic Practice: Perspective of Community and Hospital in Yogyakarta, Indonesia

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Abstract

Objectives: This study is aimed; to assess the knowledge, awareness and attitude of pharmacists in the community and hospital settings towards pharmacogenetic, to understand the differences of knowledge, awareness and attitude between community and hospital settings and to understand the factors predict the knowledge, awareness and attitude of the pharmacists.

Methods: We conducted a cross-sectional study over 60 community pharmacies and 11 clinics and hospital pharmacies. We recruited 84 hospital pharmacists in the private hospitals and 24 community pharmacists. The questionnaire about knowledge, awareness and attitude of pharmacists towards pharmacogenetic were adopted from previous study. We also collected the data of demographic by interviewing the respondents.

Results: Our study finds the significant differences of attitude between community and hospital pharmacists. The scores of knowledge, awareness and attitude in community setting are higher than the score of those in hospital settings. In the hospital setting, only education and CPD which may predict the awareness of pharmacists. In the community setting, characteristics which may predict the knowledge, awareness and attitude are outpatient services, work duration and CPD, respectively (p<0.05).

Conclusion: The knowledge and awareness of pharmacists toward pharmacogenetic in Yogyakarta are good. Pharmacists' characteristics that may predict the knowledge, awareness and attitude toward pharmacogenetic are education, internal CPD, work duration, and types of patient's service.

Introduction

Drug-response variability could be influenced by many factors which are derived from the patients, disease and drug itself [1,2]. Many studies presented that genetic variation could be used as predictor of drug-response variability predictor [3-6]. Food and Drug Administration started to introduce pharmacogenetic test results in the health care practice by giving the warning box in the drug packaging [7]. The drug-response variability together with the patients' characteristic became the consideration in making the decision for patients' treatment. The variability of drug response may cause the decrease of drug effectivity or the increase of adverse reaction [8]. Thus, the pharmacists' role in personalized medicine is needed to improve the treatment outcomes [9].

The previous study in Australia presented that the community pharmacists had poor understanding about pharmacogenetic and did not believe about their capability in counsel the patients about pharmacogenetic test results [10]. Another previous study in USA in 580 community pharmacists showed that around 87% community pharmacists had positive attitude toward pharmacogenetic test and around 57% realized their role in giving counseling to the patients about pharmacogenetic [11]. Moreover, in Qatar, the study about awareness and attitude towards pharmacogenetic was conducted among the pharmacists and doctors. This previous study found that the awareness of pharmacists and doctors were low (less than 50%) and there was no significant difference between pharmacist and doctor. However, pharmacist had more positive attitude in applying the pharmacogenetic in their daily practice than doctor [12]. In Japanese population, only around 61% patients realize the importance of pharmacogenetic testing results in predicting the drug efficacious [13].

This study is aimed to understand the knowledge, awareness and attitude of pharmacists in the community and hospital settings towards pharmacogenetic. Secondly, we want to understand the factors associated to the knowledge, awareness and attitude of the pharmacists and thirdly, to understand the differences of knowledge, awareness and attitude between community and hospital pharmacists. To the best of our knowledge, this is the first study conducted in Indonesia about the knowledge, awareness and attitude of pharmacist towards pharmacogenetic.

Method

We conducted cross-sectional study in 60 community pharmacies and 11 clinics and hospital pharmacies. We recruited 84 hospital pharmacists in the private hospitals and 24 community pharmacists.

We used the questionnaire about knowledge, awareness and attitude of pharmacists towards pharmacogenetic from the previous study [11,13]. We translated the questionnaire into Bahasa Indonesia version at the Center of Language Practices Universitas Ahmad Dahlan. We conducted the validation procedures in the 51 respondents and found that the questionnaires met the reliability criteria, discriminant and convergent validities. We also collect the data of demographic by interviewing the respondents. Data was analyzed using Student-T test or Mann Whitney test to understand demographic factors associated with knowledge, awareness and attitude of the pharmacists and to understand the differences of knowledge, awareness and attitude between community and hospital pharmacists. This study has been approved by Ethic Committee of Universitas Ahmad Dahlan No 011601010.

Results

Our study presented factors predicted the knowledge, awareness and attitude of pharmacists towards pharmacogenetic in hospital and community settings. Furthermore, we also presented the significant differences of knowledge and attitude towards pharmacogenetic between community and hospital pharmacists. Table 1 shows the characteristics of the pharmacists in hospital and community. In general, the mean age of the pharmacists, the mean year working as pharmacists in the community and hospital settings are similar. However, the pharmacists' work hours/day in the patients' service of hospital setting are less than the work hours of community setting. Most of pharmacists are female, graduated as pharmacist and graduated as pharmacist before 2013 in both settings. The proportion of facilities such as pharmaceutical bulletin is limited (less than 10%) in both settings. However, the internet access is good (more than 75%) in both setting. The self-development efforts are good (more than 75%) in both settings, except for the proportion of internal Continuing Professional Development (CPD) in hospital setting. The proportion of other languages proficiency is better in the community setting than in the hospital setting. Table 2 presents the differences of knowledge, awareness and attitude towards pharmacogenetic between community and hospital setting. There is significant differences of attitude between community and hospital pharmacists. The scores of knowledge, awareness and attitude in community setting are higher than the score of hospital settings.

Characteristics (Total=106 respondents)	Community		Hospital	
	N=84 (%)	Mean ± SD	N=24 (%)	Mean ± SD
Age	-	32.51 ± 7.19	-	31.04 ± 6.80
Work as pharmacist (year)	-	5.17 ± 5.91	-	5.79 ± 6.17
Outpatient service (hour/day)	-	4.10 ± 2.18	-	2.34 ± 2.47
Inpatient service (hour/day)	-	4.98 ± 2.16	-	2.04 ± 2.16
Sex				
Male	4 (4.9)	-	5 (20.8)	-
Female	78 (95.1)	-	19 (79.2)	-
Education				
Pharmacy degree	78 (95.1)	-	21 (87.5)	-
Master degree	4 (4.9)	-	3 (12.5)	-
Year of graduation				
≤ 2013	71 (86.6)	-	18 (75.0)	-
>2013	11 (13.4)	-	6 (25.0)	-
Internal CPD				
Yes	64 (78.0)	-	12 (50.0)	-
No	18 (22.0)	-	12 (50.0)	-
Training/Seminar				
Yes	75 (91.5)	-	24 (100.0)	-
No	7 (8.5)	-	0 (0.0)	-
Pharmaceutical Bulletin subscription				
Yes	7 (8.5)	-	2 (8.3)	-

No	75 (91.5)	-	22 (91.7)	-
Internet Access				
Yes	72 (87.8)	-	22 (91.7)	-
No	10 (12.2)	-	2 (8.3)	-
continuing professionals development				
Yes	75 (91.5)	-	23 (95.8)	-
No	7 (8.5)	-	1 (4.2)	-
Other language proficiency				
Yes	39 (47.6)	-	9 (37.5)	-
No	43 (52.4)	-	15 (62.5)	-

Table 1: Pharmacist' characteristics.

Tables 3-5 lists the results of distribution of the pharmacists' answer in every item of questions. In every domain, most of the scores in each questions are significant different between community and hospital settings. It shows that majority of answer choices are significant different between community and hospital pharmacists. Tables 6 and 7 present the characteristics which may predict the knowledge, awareness and attitude of the pharmacists in the community and hospital settings. In the hospital setting, only education and CPD which may predict the awareness of pharmacist toward Pharmacogenetic. In the community setting, characteristics which may predict the knowledge, awareness attitude are CPD, work duration and CPD, respectively ($p<0.05$). Pharmacists who attended the CPD had higher knowledge than pharmacists who did not attend the CPD. Pharmacists who have been worked for less than 5 years have higher awareness than the pharmacists with more than 5 years of work duration. Subsequently, in the outpatient setting, pharmacists who work less than 3 hours had less attitude than pharmacists who work more than 3 hours.

Characteristics	Community	Hospital	p-value
	Mean ± SD	Mean ± SD	
Knowledge	15.28 ± 1.687	14.42 ± 2.32	0.078
Awareness	5.77 ± 0.865	5.50 ± 0.933	0.338
Attitude	26.22 ± 2.172	24.29 ± 3.47	<0.05*
*: significant different			

Table 2: Differences of knowledge, awareness and attitude between community and hospital settings.

Questions	Community Pharmacist	Hospital Pharmacists	p value
Slight differences of genom may influence drug response			
Scale 1	7	2	0.096
Scale 2	75	22	<0.01*
Genetic variance can change along with the life cycle			
Scale 1	39	15	<0.01*
Scale 2	43	9	<0.01*
Genetic variance change 95% variations of drug abuse and misuse			
Scale 1	16	2	<0.01*
Scale 2	66	22	<0.01*
Warfarin packaging information			
Scale 1	14	10	0.414
Scale 2	68	14	<0.01*
Pharmacogenetic test for diagnostic			

Scale 1	35	7	<0.01*
Scale 2	47	17	<0.01*
Drug identification for pharmacogenetic test			
Scale 1	8	6	0.593
Scale 2	42	14	<0.01*
Scale 3	32	4	<0.01*
Discussion woth other healthcare			
Scale 1	9	5	0.285
Scale 2	60	12	<0.01*
Scale 3	13	7	<0.01*
Pharmacy education			
Scale 1	13	8	0.275
Scale 2	32	10	<0.01*
Scale 3	37	6	<0.01*
Total Score			
≤ 15	43	16	<0.01*
>15	39	8	<0.01*

Table 3: Distribution of pharmacists' answers in every questions of knowledge.

Questions	Community Pharmacist	Hospital Pharmacists	p value
Ethical guideline for genetic research			
Scale 1	73	22	<0.01*
Scale 2	9	2	<0.05*
Terminology of pharmacogenetic and pharmacogenomics			
Scale 1	3	4	0.705
Scale 2	79	20	<0.01*
Pharmacogenetic test covered by insurance			
Scale 1	69	19	<0.01*
Scale 2	13	5	0.059
Possible questions related to pharmacogenetic to patients			
Scale 1	38	15	<0.01*
Scale 2	42	9	<0.01*
Total Score			
≤ 5	34	11	<0.01*
>5	48	13	<0.01*

Table 4: Distribution of pharmacists' answers in every questions of awareness.

Questions	Community Pharmacist	Hospital Pharmacists	p value
Pharmacogenetic test secrease the adverse effect			
Scale 1	0	0	-
Scale 2	2	4	0.414
Scale 3	80	20	0.000*
Pharmacogenetic test optimize the drug dose			
Scale 1	2	0	-
Scale 2	6	4	0.527
Scale 3	74	20	0.000*
Pharmacogenetic test increase drug efficacy			
Scale 1	3	1	0.317
Scale 2	19	7	0.019*
Scale 3	60	16	0.000*
Relevance of pharmacogenetic with daily practice			
Scale 1	13	8	0.275
Scale 2	46	12	0.000*
Scale 3	23	4	0.000*
Priority of pharmacogenetic learning			
Scale 1	7	5	0.564
Scale 2	46	14	0.000*
Scale 3	29	5	0.000*
Pharmacogenetic counseling			
Scale 1	0	2	-
Scale 2	16	8	0.102
Scale 3	66	14	0.000*
Access of pharmacogenetic information			
Scale 1	7	7	1.000
Scale 2	27	9	0.003*
Scale 3	48	8	0.000*
Computerization as tool for drug-gene interaction checker			
Scale 1	3	1	0.317
Scale 2	28	8	0.001*
Scale 3	51	15	0.000*
Patients' counseling about pharmacogenetic			
Scale 1	4	6	0.527
Scale 2	39	9	0.000*

Scale 3	39	9	0.000*
Drug allergy as patient's history			
Scale 1	0	0	-
Scale 2	0	2	-
Scale 3	82	22	0.000*
Total Score S			
≤ 26	46	16	0.001*
>26	36	8	0.000*

Table 5: Distribution of pharmacists' answers in every questions of Attitude.

Characteristics	Domains		
	Knowledge	Awareness	Attitude
Age (n)			
≤30 yo (14)	14.50 ± 2.653	5.29 ± 0.726	24.36 ± 3.671
>30 yo (10)	14.30 ± 1.889	5.80 ± 1.135	24.20 ± 3.360
p value	0.859	0.155	0.883
Sex (N)			
Female (19)	14.00 ± 2.739	5.20 ± 0.837	23.20 ± 3.564
Male (5)	14.53 ± 2.270	5.58 ± 0.961	24.58 ± 3.485
p value	0.640	0.409	0.391
Education (N)			
Pharmacy degree (21)	14.38 ± 2.459	5.33 ± 0,.856	24.38 ± 3.626
Master degree (S2) (3)	14.67 ± 1.155	6.67 ± 0.577	23.67 ± 2.517
p value	0.895	0.021*	0.759
Work duration (N)			
≤5 years (16)	14.69 ± 2.549	5.44 ± 0.814	24.62 ± 3.722
>5 years (8)	13.88 ± 1.808	5.62 ± 1.188	23.62 ± 3.021
p value	0.403	0.583	0.498
Outpatient service (N)			
≤3 hours/day (18)	14.39 ± 2.253	5.56 ± 0.922	24.61 ± 3.760
>3 hours/day (6)	14.50 ± 2.739	5.33 ± 1.033	23.33 ± 2.422
p value	0.919	0.527	0.384
Inpatient service (N)			
≤3 hours/day (19)	14.58 ± 2.545	5.53 ± 0.964	24.16 ± 3.236
>3 hours/day (5)	13.80 ± 1.095	5.40 ± 0.894	24.80 ± 4.658
p value	0.429	0.851	0.642

Year of graduation (N)			
≤ 2013 (18)	14.17 ± 2.358	5.61 ± 0.979	24.22 ± 3.490
>2013 (6)	15.17 ± 2.229	5.17 ± 0.753	24.50 ± 3.728
p value	0.399	0.275	0.789
Internal CPD (N)			
Yes (12)	14.08 ± 2.483	5.00 ± 0.853	24.50 ± 3.826
No (12)	14.75 ± 1.712	6.00 ± 0.739	24.08 ± 3.232
p value	0.599	0.010*	0.816
Pharmaceutical Bulletin subscription (N)			
No (22)	14.36 ± 2.401	5.41 ± 0.908	24.00 ± 3.450
Yes (2)	15.00 ± 1.414	6.50 ± 0.707	27.50 ± 2.121
p value	0.711	0.110	0.172
Internet access (N)			
No (2)	13.50 ± 2.121	4.50 ± 0.707	22.50 ± 0.707
Yes (22)	14.50 ± 2.365	5.59 ± 0.908	24.45 ± 3.582
p value	0.597	0.110	0.372
CPD (N)			
No (1)	11.00 ± 0.000	4.00 ± 0.000	20.00 ± 0.000
Yes (23)	14.57 ± 2.253	5.57 ± 0.896	24.48 ± 3.423
p value	0.144	0.127	0.191
Other languages proficiency (N)			
No (15)	13.53 ± 2.134	5.20 ± 0.862	23.87 ± 3.378
Yes (9)	15.89 ± 1.900	6.00 ± 0.866	25.00 ± 3.708
p value	0.026	0.059	0.402

Table 6: Pharmacists' characteristics which are related to knowledge, awareness and attitude in the hospital setting (n=24).

	Domains		
Characteristics	**Knowledge**	**Awareness**	**Attitude**
Age (N)			
≤30 yo (38)	15.58 ± 1.426	5.89 ± 0.863	25.71 ± 2.312
>30 yo (44)	15.02 ± 1.861	5.66 ± 0.861	26.66 ± 1.964
p value	0.206	0.249	0.070
Sex (N)			
Male (4)	15.75 ± 0.500	5.75 ± 1.500	26.00 ± 0.816
Female (78)	15.26 ± 1.724	5.77 ± 0.836	26.23 ± 2.221
p value	0.538	0.487	0.761

Education (N)			
Pharmacy degree (78)	15.28 ± 1.658	5.73 ± 0.832	26.18 ± 2.161
Master degree (4)	15.25 ± 2.500	6.50 ± 1.291	27.00 ± 2.582
p value	0.956	0.171	0.521
Work Duration (N)			
≤ 5 years (53)	15.47 ± 1.475	5.91 ± 0.815	26.11 ± 2.399
>5 years (29)	14.93 ± 1.999	5.52 ± 0.911	26.41 ± 1.701
p value	0.228	0.033*	0.614
Outpatient service (N)			
≤ 3 hours/day (40)	15.30 ± 1.924	5.72 ± 0.905	25.50 ± 2.100
>3 hours/day (42)	15.26 ± 1.449	5.81 ± 0.833	26.90 ± 2.034
p value	0.556	0.506	0.002*
Inpatient service (N)			
≤3 hours/day (25)	14.92 ± 2.060	5.64 ± 1.036	25.76 ± 2.026
>3 hours/day (57)	15.44 ± 1.488	5.82 ± 0.782	26.42 ± 2.220
p value	0.410	0.250	0.117
Year of graduation (N)			
≤ 2013 (71)	15.32 ± 1.763	5.70 ± 0.868	26.31 ± 2.033
>2013 (11)	15.00 ± 1.095	6.18 ± 0.751	25.64 ± 2.976
p value	0.408	0.052	0.625
Internal CPD (N)			
No (18)	15.44 ± 1.617	5.61 ± 0.916	26.39 ± 2.004
Yes (64)	15.23 ± 1.716	5.81 ± 0.852	26.17 ± 2.229
p value	0.761	0.340	0.847
Training / Seminar (N)			
No (7)	15.00 ± 1.000	5.71 ± 0.951	24.86 ± 3.716
Yes (75)	15.31 ± 1.740	5.77 ± 0.863	26.35 ± 1.962
p value	0.455	0.768	0.298
Pharmaceutical Bulletin subscription (N)			
No (75)	15.29 ± 1.738	5.76 ± 0.883	26.24 ± 2.186
Yes (7)	15.14 ± 1.069	5.86 ± 0.690	26.00 ± 2.160
p value	0.709	0.610	0.900
Internet access (N)			
No (10)	15.30 ± 1.160	5.80 ± 0.919	26.10 ± 2.923
Yes (72)	15.28 ± 1.754	5.76 ± 0.864	26.24 ± 2.073
p value	0.942	0.994	0.813

CPD (N)			
No (7)	14.00 ± 1.633	5.57 ± 0.976	25.57 ± 2.637
Yes (75)	15.40 ± 1.652	5.79 ± 0.859	26.28 ± 2.134
p value	0.035*	0.694	0.426
Other languages proficiency (N)			
No (43)	15.16 ± 1.689	5.65 ± 0.923	25.98 ± 2.076
Yes (39)	15.41 ± 1.697	5.90 ± 0.788	26.49 ± 2.270
p value	0.465	0.127	0.270

Table 7: Pharmacist' characteristics which are related to knowledge, awareness and attitude in the community setting (n=82).

Discussion

Our study presents the knowledge, awareness and attitude of pharmacists in Yogyakarta, Indonesia with the new perspectives of community and hospital settings. Indonesia is developed country with around 360 tribes which has big chance for drug-response variations based on genetics. As we know that pharmacists who work in the hospital in Indonesia also have managerial jobs which became the obstacle in conducting the counseling to the patients. The human resources are also limited in the hospital to improve the pharmaceutical care service. Factors which could predict the knowledge, awareness and attitude of the pharmacists are being explored in this study. We show the choices differences in every question between community and hospital pharmacist.

The score of attitude of community pharmacists is significant higher than hospital pharmacists. According to the characteristics of the pharmacists, the community pharmacists had more chance in doing internal CPD. They also had more time to give inpatient and outpatient services than the hospital pharmacists. Other characteristics of self-development are better in the hospital setting than community setting. This could be caused by the load of administrative and managerial jobs that should be done in the hospital setting in Indonesia. The previous study in Qatar also presented the similar results that the awareness of hospital pharmacists toward Pharmacogenetic is low although they had positive attitude in the implication [12]. However, the previous study in Jordan also presented low pharmacists' knowledge and positive attitude about Pharmacogenetic in the city [14].

Pharmacogenetic has been started in Indonesia Pharmacy education since 2013. Currently this course is available in the theory and still have many obstacles to be conducted during the course and in the clinical practice, thus the implication is still far from the theory. The cost of Pharmacogenetic test is also became the issue in the health provider setting.

Education and internal CPD are factors that related to the pharmacists' awareness in the hospital setting. This could be caused by the curriculum of education level in the pharmacy program. The curriculum of Pharmacy program is arranged for the practice skill of pharmacists in the community pharmacy. However, in the master degree of pharmacy, the curriculum is composed based on the science development, including Pharmacogenetic. The previous study presented that only small proportion of pharmacists stated that the knowledge about Pharmacogenetic was derived from the faculty. Majority of them stated that the Pharmacogenetic knowledge was derived from the seminar [10]. Moreover, bulletin and seminar subscription also enhanced their pharmacogenetic knowledge [15]. In the community setting, the internal CPD also may predict the pharmacists' knowledge and the outpatient's service hour could predict pharmacist' attitude. Previous study stated that some characteristics like sex, age, level of education type of service and the intensity of CPD [16-18]. Roeder et al. showed that pharmacists with Pharm D degree had better knowledge than the lower degree [17]. Pharmacist who worked in the community or hospital less than 5 years had good interests in pharmacogenetic than pharmacists who work more than 5 years [16]. Previous study in Australia also showed that new graduates of pharmacists had good knowledge than pharmacists who has been worked for many years [10]. Pharmacists who worked in the inpatient setting had better attitude to pharmacogenetic than pharmacists who worked in the outpatient setting. This could be caused by the intensity of pharmacist-patient-other health care's interaction in the inpatients setting, thus, the discussion about treatment effectivity could be more intensive.

According to the opened-ended questions, most of the pharmacists (66.7%) are willing to do the counseling related to the pharmacogenetic test results, however, due to the limited knowledge they stated that they need more time to learn about pharmacogenetics (33%). Around 33.3% stated that the databases of pharmacogenetic in Indonesia are still rare.

I general, our study finds that the pharmacists both in community and hospital setting has good theoretical knowledge and high awareness that implied the willingness of the pharmacists to applicate the pharmacogenetic test in the clinical practice. Our study findings are in line with some previous studies that presented the good knowledge and awareness, but negative attitude [19-21]. However, some constraints are presence in the clinical practice of pharmacogenetic, such as; limited technical knowledge, the uncommon topic of pharmacogenetic during the CPD, the high cost of pharmacogenetic course, the high load of managerial jobs and the limited pharmacist-patient- other health care interaction. Our study has limited sample size of hospital pharmacists, even though we recruited all hospital pharmacists in the particular private hospital and clinics.

Conclusion

The knowledge and awareness of hospital and community pharmacists about pharmacogenetic in Yogyakarta are good. However,

there are some constraints which became the reasons for the limited attitude about pharmacogenetic; Pharmacists' characteristics that may predict the knowledge, awareness and attitude toward pharmacogenetic are education, internal CPD, work duration, and types of patient's service.

Acknowledgement

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