Health screening programs in community pharmacies and their importance of identifying people with chronic diseases such as diabetes or hypertension are well known. The results of these services could initiate appropriate treatment and prevent long-term complications from chronic diseases. Diabetes mellitus and hypertension are major global problems. The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. Data from 2015 indicate that one in 11 adults has diabetes. In 2040, about one in 10 adults will be sick. Moreover, one in two adults has undiagnosed diabetes (1). Globally, the overall prevalence of increased blood pressure in adults aged 25 and over was about 40.0% in 2008. The number of people with uncontrolled hypertension increased from 600 million in 1980 to nearly 1 billion in 2008 (2). This dramatic numbers brought about many changes and activities in health promotion around the world.

It is very important to perform health screenings in each population. Community pharmacies in many countries have implemented screening services which are very sensitive and effective. In the Swedish study, 6.9% elderly persons in community pharmacies in many countries have implemented screening services which are very sensitive and effective.
pharmacy were detected with suspicions for diabetes type 2 and 71.5% had at least two risks factors of this disease. In addition, 54.0% individuals showed elevated blood pressure and 16.3% had hypertension (3). The Thai Diabetes Prevention Program in community pharmacies identified that half of the tested clients were at risk of diabetes and provided an opportunity for participants to learn about the prevention of diabetes. During a 3-month service for 397 individuals, nearly half were at a high risk for diabetes (4). These studies showed that it is very important to implement a screening campaign for chronic diseases in a community pharmacy. A sequential screening in pharmacy practice may detect up to 7% patient suspected for diabetes. Most people visiting community pharmacy are open to counselling about lifestyle. Health screenings are recommended in asymptomatic adults, including those with smoking habits, high blood pressure, high cholesterol, and obesity (5).

Pharmacists working in community pharmacies are respected and trusted by society and therefore are in an excellent position to engage in screening, monitoring and educating patients with potential problem of chronic diseases. Community-based screening programs can result in delay of complications of chronic diseases and improved quality of life.

The aim of the study was to evaluate and compare opinions about health screening services in community pharmacies located in Poznan, Poland, and Chicago, USA. The effect of age, gender and education was evaluated.

**MATERIALS AND METHODS**

The survey as a cross sectional study was carried out from March 2016 to June 2016 in community pharmacies. It covered 265 respondents in Poznan (37.0% men and 63.0% women) and 190 participants in Chicago (42.6% men and 57.4% women) selected at random. They were patients of independent community pharmacies in Poznan and Chicago that voluntarily agreed to fill out the questionnaire. The most numerous group of respondents consisted of Poles aged from 18 to 30 years old (32.4%) and Americans aged from 18 to 30 years old and from 41 to 50 years old (in both cases 23.2%). The majority of the responding participants in Poznan and Chicago had graduate education (37.7% and 37.9%, respectively). Socio-economic data included information about gender, age and education.

**Table 1. Characteristics of study participants.**

<table>
<thead>
<tr>
<th></th>
<th>Poznan n (%)</th>
<th>Chicago n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>167 (63.0)</td>
<td>109 (57.4)</td>
</tr>
<tr>
<td>Male</td>
<td>98 (37.0)</td>
<td>81 (42.6)</td>
</tr>
<tr>
<td>Total</td>
<td>265 (100.0)</td>
<td>190 (100.0)</td>
</tr>
<tr>
<td>Age(years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>86 (32.4)</td>
<td>44 (23.2)</td>
</tr>
<tr>
<td>31-40</td>
<td>34 (12.8)</td>
<td>36 (18.9)</td>
</tr>
<tr>
<td>41-50</td>
<td>60 (22.6)</td>
<td>44 (23.2)</td>
</tr>
<tr>
<td>51-60</td>
<td>55 (20.8)</td>
<td>29 (15.3)</td>
</tr>
<tr>
<td>61-70</td>
<td>19 (7.2)</td>
<td>28 (14.7)</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>11 (4.2)</td>
<td>9 (4.7)</td>
</tr>
<tr>
<td>Total</td>
<td>265 (100.0)</td>
<td>190 (100.0)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>4 (1.5)</td>
<td>3 (1.6)</td>
</tr>
<tr>
<td>Vocational</td>
<td>32 (12.1)</td>
<td>17 (8.9)</td>
</tr>
<tr>
<td>High school</td>
<td>62 (23.4)</td>
<td>58 (30.5)</td>
</tr>
<tr>
<td>College</td>
<td>67 (25.3)</td>
<td>40 (21.1)</td>
</tr>
<tr>
<td>Graduate</td>
<td>100 (37.7)</td>
<td>72 (37.9)</td>
</tr>
<tr>
<td>Total</td>
<td>265 (100.0)</td>
<td>190 (100.0)</td>
</tr>
</tbody>
</table>
The study confirmed that higher percentage of respondents reported suffering from diabetes and hypertension in Chicago compared with Poznań (respectively $p = 0.006$, $p = 0.004$; Table 2) and had a wider knowledge about possibility of simple diagnostic tests purchasing in community pharmacy ($p < 0.001$; Table 3). Information about prevention of common chronic diseases were expected by 72.1% of respondents in Poznań and 77.0% in Chicago. Availability of information on common disease prevention was mainly expected by Polish and American respondents in 18-30 and 61-70 year old group ($p = 0.049$, $p = 0.002$, respectively) and by Americans with vocational and graduate education ($p = 0.011$; Tab. 4.). Both groups were interested in screening services participating concerning common chronic diseases in community pharmacy.

### RESULTS

Table 2. Prevalence of diabetes and hypertension in study participants.

<table>
<thead>
<tr>
<th>Disease:</th>
<th>Poznań n (%)</th>
<th>Chicago n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>Yes 12 (4.5) 10 (5.3)</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>No 252 (95.5) 173 (91.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don't know 0 (0.0) 7 (3.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 264 (100.0) 190 (100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>Yes 62 (23.4) 51 (26.8)</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>No 203 (76.6) 132 (69.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don't know 0 (0.0) 7 (3.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 265 (100.0) 190 (100.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Respondents' opinions concerning possibility of purchasing simple diagnostic tests in a community pharmacy.

| Question in questionnaire: Do you know that you can purchase in a community pharmacy diagnostic tests (e.g., to measure blood levels of glucose and cholesterol)? |
|-----------------|-----------------|-----------------|---------|
| Yes 119 (44.9) 132 (71.0) | < 0.001 | |
| No 144 (54.3) 54 (29.0) | | | |
| I don't know 2 (0.8) 0 (0.0) | | | |
| Total 265 (100.0) 186 (100.0) | | | |

Statistical analysis of the results was performed using the Statistica 10.0 application (StatSoft®). The relationship between analyzed nominal data was performed by chi-square test of independence ($\chi^2$). All statistical analyses were performed at $p < 0.05$. 

An anonymous questionnaire was developed in Polish and English by the authors of this study to assess opinions about health screening services in a community pharmacy among the patients. Translation from Polish to English was done by a bilingual pharmacist to ensure that questions addressed identical concepts. The content of survey was validated by licensed pharmacists in Poznań and in Chicago. The survey included also a short description of this new service.
(66.8% Poles and 58.0% Americans, Fig. 1), but American respondents indicated it more often for diabetes and hypertension than Poles (p = 0.039, p < 0.001, respectively; Table 5). Poles assumed that such services should be paid by National Health Fund and Americans selected more often community pharmacy as a source of foundation (p < 0.001; Table 6). Participants were also asked to evaluate screening service in pharmacy. Respondents in Poznan preferred to pay for these service about 23 złotych while in Chicago 41 USD (157 złotych). In Poznan, the most interested in screenings were participants from age groups 18-30 and 51-60 years old, and with primary education (p < 0.001).

Table 4. Effect of age and education on expectation of availability of information about prevention of common chronic diseases in a community pharmacy.

| Question in questionnaire: Would you like your community pharmacy provide information on prevention of most common public diseases? |
|---|---|---|---|---|
| | Yes | No | I don't know | Total |
| **POZNAN** |
| Age (years) | | | | |
| 18-30 | 70 (81.4) | 8 (9.3) | 8 (9.3) | 86 (100.0) | 0.049 |
| 31-40 | 24 (70.6) | 9 (26.5) | 1 (2.9) | 34 (100.0) | |
| 41-50 | 38 (63.3) | 9 (15.0) | 13 (21.7) | 60 (100.0) | |
| 51-60 | 36 (65.5) | 7 (12.7) | 12 (21.8) | 55 (100.0) | |
| 61-70 | 16 (84.2) | 1 (5.3) | 2 (10.5) | 19 (100.0) | |
| > 70 | 7 (63.6) | 2 (18.2) | 2 (18.2) | 11 (100.0) | |
| Total | 191 (72.1) | 36 (13.6) | 38 (14.3) | 265 (100.0) | |
| Education | | | | |
| Primary | 4 (100.0) | 0 (0.0) | 0 (0.0) | 4 (100.0) | 0.056 |
| Vocational | 23 (71.9) | 2 (6.2) | 7 (21.9) | 32 (100.0) | |
| High school | 39 (62.9) | 10 (16.1) | 13 (21.0) | 62 (100.0) | |
| College | 57 (85.0) | 5 (7.5) | 5 (7.5) | 67 (100.0) | |
| Graduate | 68 (68.0) | 19 (19.0) | 13 (13.0) | 100 (100.0) | |
| Total | 191 (72.1) | 36 (13.6) | 38 (14.3) | 265 (100.0) | |
| **CHICAGO** |
| Age (years) | | | | |
| 18-30 | 38 (88.4) | 5 (11.6) | 0 (0.0) | 43 (100.0) | 0.002 |
| 31-40 | 26 (76.5) | 7 (20.6) | 1 (2.9) | 34 (100.0) | |
| 41-50 | 34 (77.3) | 6 (13.6) | 4 (9.1) | 44 (100.0) | |
| 51-60 | 21 (72.4) | 3 (10.3) | 5 (17.3) | 29 (100.0) | |
| 61-70 | 23 (82.1) | 4 (14.3) | 1 (3.6) | 28 (100.0) | |
| > 70 | 2 (22.2) | 4 (44.5) | 3 (33.3) | 9 (100.0) | |
| Total | 144 (77.0) | 29 (15.5) | 14 (7.5) | 187 (100.0) | |
| Education | | | | |
| Primary | 1 (33.3) | 1 (33.3) | 1 (33.3) | 3 (100.0) | 0.011 |
| Vocational | 16 (94.1) | 0 (0.0) | 1 (5.9) | 17 (100.0) | |
| High school | 42 (75.0) | 9 (16.1) | 5 (8.9) | 56 (100.0) | |
| College | 23 (59.0) | 10 (25.6) | 6 (15.4) | 39 (100.0) | |
| Graduate | 62 (86.1) | 9 (12.5) | 1 (1.4) | 72 (100.0) | |
| Total | 144 (77.0) | 29 (15.5) | 14 (7.5) | 187 (100.0) | |
Table 5. Respondents’ interest in participation in health screening services for diabetes and hypertension in a community pharmacy.

<table>
<thead>
<tr>
<th>Patients’ diseases:</th>
<th>Poznań n (%)</th>
<th>Chicago n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>137 (79.2)</td>
<td>89 (89.0)</td>
<td>0.039</td>
</tr>
<tr>
<td>No</td>
<td>36 (20.8)</td>
<td>11 (11.0)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>173 (100.0)</td>
<td>100 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>118 (68.2)</td>
<td>96 (96.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>No</td>
<td>55 (31.8)</td>
<td>4 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>173 (100.0)</td>
<td>100 (100.0)</td>
<td></td>
</tr>
</tbody>
</table>

p < 0.05

Table 6. Preferences for source of funding for health screening services in a community pharmacy.

<table>
<thead>
<tr>
<th>Anwers:</th>
<th>Poznań n (%)</th>
<th>Chicago n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Health Fund / Government</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>225 (93.0)</td>
<td>84 (45.9)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>No</td>
<td>17 (7.0)</td>
<td>99 (54.1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>242 (100.0)</td>
<td>183 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Community pharmacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (4.1)</td>
<td>27 (14.7)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>No</td>
<td>232 (95.9)</td>
<td>156 (85.3)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>242 (100.0)</td>
<td>183 (100.0)</td>
<td></td>
</tr>
</tbody>
</table>

p < 0.05

Chicago, the highest interest was in age group 51-60 years old, with high school education (p < 0.001; Table 7). Additional analysis of results by age, gender and education didn’t achieve the level of statistical significance.

DISCUSSION AND CONCLUSION

The need for implementation of screening services was confirmed on the basis of patients’ opinions in this study. American respondents indi-
cated it more often than Poles for diabetes and hypertension. Maybe it is because of the fact that Americans more frequently suggested that they were suffering from diabetes and hypertension. International Diabetes Federation shows in turn that there is 39 million of diabetes in America and 52 million in Europe (6). There is also about 40.0% of European and 36.0% of American population with a higher blood pressure (2). Individuals participating in community pharmacy screening services in Poland were more diverse; it is likely some of them could have undiagnosed diseases. According to global statistic there are about 33.1% of undiagnosed diabetes in Poland and 27.1% in North America (6).

Participants in this study were also interested in education about prophylaxis and prevention of common chronic diseases. Previous studies showed interest to learn about these conditions and that pharmacists were important part of health care system (7, 8). Based on the survey conducted among the pharmacists in 2011 after the screening campaign, the screening process took < 10 min for 3% of participants, 10–15 min for 27%, 15–20 min for

<table>
<thead>
<tr>
<th>Table 7. Effect of age and education on preference for cost of health screening services in a community pharmacy.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question in questionnaire:</strong> How much in your opinion should be the cost for screening on common diseases performed in a community pharmacy?</td>
</tr>
<tr>
<td><strong>n</strong></td>
</tr>
<tr>
<td><strong>POZNAN</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>18-30</td>
</tr>
<tr>
<td>31-40</td>
</tr>
<tr>
<td>41-50</td>
</tr>
<tr>
<td>51-60</td>
</tr>
<tr>
<td>61-70</td>
</tr>
<tr>
<td>&gt;70</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Primary</td>
</tr>
<tr>
<td>Vocational</td>
</tr>
<tr>
<td>High school</td>
</tr>
<tr>
<td>College</td>
</tr>
<tr>
<td>Graduate</td>
</tr>
<tr>
<td><strong>CHICAGO</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>18-30</td>
</tr>
<tr>
<td>31-40</td>
</tr>
<tr>
<td>41-50</td>
</tr>
<tr>
<td>51-60</td>
</tr>
<tr>
<td>61-70</td>
</tr>
<tr>
<td>&gt; 70</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Primary</td>
</tr>
<tr>
<td>Vocational</td>
</tr>
<tr>
<td>High school</td>
</tr>
<tr>
<td>College</td>
</tr>
<tr>
<td>Graduate</td>
</tr>
</tbody>
</table>

p < 0.05
32%, 20–25 min for 20%, 25–30 min for 14%, and > 30 min, for 4%. Pharmacists stated that nearly all participants were very satisfied with the screening and the quality of information provided (9). In addition, lifestyle modifications through diet alterations and exercise improvement, education can delay or prevent progression from impaired glucose tolerance to type 2 diabetes or hypertension presence (10). Screening and counselling in community pharmacies of individuals at risk for diabetes may results in changes in lifestyle and body weight (11). Moreover, multidisciplinary screening and interventions by pharmacists and also nurses resulted in reduced blood pressure in patients with diabetes (12).

The sequential screening method for diabetes is reasonable in terms of cost and effectiveness (13). Diabetes and hypertension pharmacy-based screening was more costly, but the success rate for referral was higher compared with a community-based service (14). In this study, Poles preferred that such services should be paid by National Health Fund while Americans preferred community pharmacy to pay costs of screening services. Respondents in Poznań determined the sum as 23 złotych and in Chicago as 41 USD (157 złotych). The most interested in paying were Poles in the age groups 18-30 and 51-60 years old, with primary education. In Chicago, participants 51-60 years old with high school education were interested in paying higher cost. Krass and colleagues reported the real total cost of screening each person in a pharmacy was AUS $ 7.76 (about 23 zloty) for the tick test only and AUS $ 11.83 (about 35 zloty) for the sequential screening – tick test only and fingertip test for capillary blood glucose service and consisted of variable and fixed costs (13).

Screening programs for chronic conditions have limitations, including substantial cost, limited participation, false-positive cases, false reassurance for negative cases, and potential for social inequity (15, 16). Community pharmacy screening services can help increase health awareness and identify new cases of disease (17-19). The limitation of conducted study is the sample because it is not representative of the general population in Poland and United States of America. The study sample consisted of participants from Poznań and Chicago. Thus, the results may not be generalizable to populations other than the study sample. The respondents’ willingness to pay for screening services was a subjective opinion on the amount they may agree to pay not an actual transaction data.

There is no data from Polish studies about health screenings in community pharmacy so this investigation provides first set of opinions about such a program in Poland. The increased respondents’ willingness to benefit from health screening services should encourage pharmacists to develop and provide screenings in community pharmacies. The results of the study support the need for health screenings in a community pharmacy. Future investigation is needed to understand how to effectively organize and finance these community pharmacy services in Poland.

Acknowledgment

This study was supported by the funding for young scientists from Poznan University of Medical Sciences (grant no. 502-14-03314429-09415).

REFERENCES


Received: 26. 08. 2016