

ORIGINAL RESEARCH

Relationship between COPD and lower socioeconomic status in farmers from south-eastern Poland (Lublin region)

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ABSTRACT

Introduction: Lower socioeconomic status is considered to be an independent risk factor of chronic conditions, such as chronic obstructive pulmonary disease (COPD). COPD, one of the major public health problems worldwide, is a chronic inflammatory lung disease of a multifactorial background. COPD morbidity in rural areas has been higher than in urban settings, as apart from the major causative factor, tobacco smoking, the burden of this disease in rural environments is also connected to additional occupational factors (organic dusts). The management of chronic diseases seems to be particularly difficult in rural areas. The aim of the study was to analyze the socioeconomic status of farmers suffering from COPD in comparison to healthy farmers.

Methods: Thirty farmers with COPD and 34 healthy farmers from the Lublin region (Poland) were investigated based on the area of land they possessed (an indicator used in the health insurance system in Poland to classify farmers). The farmers from five rural communes were selected by general practitioners. Statistical analysis was performed by non-parametric Mann–Whitney U-test for the differences between area of farms. The $p < 0.05$ level was considered as significant.

Results: Area of land (median: 1.5 ha, 25th–75th percentile: 1.0–4.0) owned by farmers with COPD was significantly lower than area of farms belonging to healthy farmers (median: 7.0 ha, 25th–75th percentile: 3.0–10.0) ($p < 0.0001$, Mann–Whitney U-test).

Conclusions: In rural areas individuals with COPD are characterized by significantly lower socioeconomic status than healthy persons. COPD is a major health problem, especially in rural areas, which may indicate that policy-makers should consider addressing equity in COPD management in rural areas.

Key words: COPD, equity, farmers, poverty, rural area.



Introduction

Chronic obstructive pulmonary disease (COPD) is one of the major, and still increasing, healthcare problems worldwide – causing considerable public health loss and increasing economic burden. The World Health Organization (WHO) defines COPD as ‘a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible’¹. Diagnosis of COPD, besides presence of symptoms (like cough, sputum production, or dyspnoea) and physical examination, is mainly based on lung function testing (spirometry)^{1,2}. Currently, COPD affects more than 200 million patients and has been predicted to become the third-leading cause of death within the next 20 years^{3,4}. According to WHO, in Europe alone deaths from COPD are anticipated to rise by about 20%, from 248 000 in 2008 to about 300 000 in 2030⁵⁻⁸. Given its increasing prevalence with age, and the inevitable ageing of societies globally, COPD probably poses one of the biggest threats for the world’s healthcare systems.

Apart from the leading causative factor of COPD, which is tobacco smoking, other significant risk factors of this disease are cited by WHO, among them organic dusts (including biomass fuels and occupational dusts)⁹⁻¹¹. According to the American Thoracic Society, in the USA occupational risk factors are responsible for about 20% of COPD cases in general (and, in case of non-smokers, this ratio goes up to about 30%)^{12,13}. Indeed, occupational exposures, including organic dusts, are still an underestimated cause of COPD. This is particularly evident in relation to occupational biohazards affecting rural populations^{13,14}. Millions of farmers and workers in the agricultural industry throughout the world are exposed to organic dust and thus the COPD morbidity in rural areas is usually higher than in urban areas¹⁵⁻³⁴.

In Poland, no holistic epidemiological study, covering a representative sample of the Polish population, has been conducted concerning COPD³⁵. In smaller studies COPD was identified in 10–26% of an examined group³⁶⁻³⁸.

Respiratory diseases, led by the most frequently occurring one, COPD, are the fourth most common cause of death in Poland^{35,39}. According to epidemiologic projections, the importance of these pathologies, including economic burden, will be increasing⁴⁰.

The only study conducted in the Lublin region of Poland showed a high incidence of respiratory abnormalities of obstructive character in airways (11%) and a high ratio of patients from rural areas who did not receive proper treatment⁴¹. A study comparing rural and urban dwellers of the Krakow region supported the conclusion of higher prevalence of COPD in rural areas⁴².

Agricultural activity in Poland is still considerably higher than in many European countries (perhaps comparable only to countries such as France). Contrary to other Central and Eastern European countries, which also passed a period of Soviet domination, the land was never collectivized. The agricultural structure of small individual farms has prevailed^{43,44}. Moreover, the decades under communist rule were characterized by increased fragmentation of the farm structure, leading to a growing number of small farms (1–10 ha). Even in 2005 the percentage of farms greater than 20 ha was only 4.5%^{45,46}. Following this data, a number of farmers and inhabitants of rural areas is also considerable. A total of 16.2% of Polish inhabitants work as farmers. However, agriculture produces only 4.1% of Polish GDP⁴⁷⁻⁵⁰. Shrinking of agriculture share in Polish GDP caused by the economic transformation after 1989 was not followed by similarly significant adjustment in farmer numbers^{45,46,48}. Only in the last few years has it started to bring a decline in the number of people employed on farms^{46,47}.

Chronic conditions are strongly correlated with poverty. Socioeconomic status has been often described as an independent risk factor of a chronic condition⁵¹. This connection (also valid for COPD) has been thoroughly studied in developing countries⁵². However, growing evidence shows that in developed countries poverty and chronic diseases are also connected⁵³⁻⁵⁶. Lower socioeconomic status not only means lower quality of care but it also impairs prevention. It is more difficult for poor people to avoid the risk factor of a chronic disease, often due to lack of



knowledge but also due to scarcity of resources⁵⁷. This is especially difficult to address in rural areas as the management of chronic diseases, often requiring special policy tools, seems to be particularly difficult in remote places^{25,58}. Rural areas are characterized by a significant distance to healthcare facilities, specialists, and by different epidemiologic features.

It is also worth mentioning that chronic diseases (including COPD) both in developed and developing countries used to affect mainly poorer parts of the population⁵²⁻⁵⁴. Additionally, COPD has an impoverishing effect on affected people⁵⁹⁻⁶³. In the rural area of Poland the issue of poverty connected to chronic diseases has been shown by Sygit et al⁶⁴.

The aim of the study was to analyze the socioeconomic status of farmers suffering from COPD in comparison to healthy farmers.

Methods

Examined population

The presented work is a subject-based, cross-sectional study. A group of 30 farmers suffering from COPD (in stage I–II of the disease, according to GOLD (Global Initiative for Chronic Obstructive Lung Disease), an internationally recognized COPD classification), was examined². The group comprised 17 men and 13 women, aged 54.3 ± 7.9 years (range 39–70 years). In the group 53.3% (16 persons) were tobacco smokers, 20% (6 persons) were ex-smokers, and 26.7% (8 persons) were non-smokers.

As a reference group 34 healthy farmers were examined. The group comprised 15 men and 19 women, aged 43.6 ± 13.1 years (range 20–68 years). In the group 23% (8 persons) were tobacco smokers, 12% (4 persons) were ex-smokers, and 65% (22 persons) were non-smokers.

The professionally active farmers – based on the diagnosis of COPD according to GOLD (stage I and II) and lack of other chronic illnesses for the first group, and lack of any chronic illness for the control group – were selected by their general

practitioners from five rural communes in the Lublin region (south-eastern Poland): Fajslawice, Urzędów, Strzyżewice, Cyców and Kamionka (Fig1). The appropriateness of COPD diagnosis was additionally confirmed by a specialist of pulmonary medicine. (See ‘Statistical analysis’ below for results of statistical power calculation for sample sizes.)

Lung function testing

To confirm the diagnosis of COPD and stage of the COPD progression, each examination was conducted with the use of EasyOne Model 2001 spirometer (Medizintechnik AG, Zurich, Switzerland). Forced vital capacity (VC), forced expiratory volume in the first second (FEV1) and FEV1/VC (%) were measured. Both pre-shift and post-shift lung function examinations were conducted. Results were expressed as absolute values and as percentages of predicted values. The lung function testing was in accordance with European Respiratory Society guidelines⁶⁵.

Questionnaire examination

The data (including the area of land owned by farmers) were gathered by using the questionnaire developed and validated at the Institute of Rural Health in Lublin for the examination of work-related symptoms caused by organic dusts⁶⁶. In Poland, the criterion of owned area of land expressed in hectares determines the status of a farmer in relation to healthcare insurance⁶⁷⁻⁶⁹.

Statistical analysis

Statistical analysis was performed by non-parametric testing using the Mann–Whitney U-test for analysis of the differences between area of farms in both healthy and COPD groups. The $p < 0.05$ level was considered as significant. As non-parametric tests were used, the data were mainly described by median and 25th–75th percentiles (except the description of lung function parameters which, traditionally, are described as mean \pm standard deviation (SD)). All statistical analyses were carried out with Statistica v8.0 (Statsoft Inc.; <http://www.statsoft.com>).



Figure 1: Patients and healthy study participants recruitment: map of Lublin region and five rural communes.

Statistical power, calculated for measured values (area of land in hectares) and sample sizes (number of individuals in each of the two groups), was calculated as 99.9% ($p < 0.05$ level). The DSS Statistical Power Calculator was used (two-tailed test) (DSS Research; <http://www.dssresearch.com/KnowledgeCenter/toolkitcalculators.aspx>).

Ethics approval

All subjects gave formal consent to participate in the study. The Ethics Commission of the Institute of Rural Health approved human subjects' protocols (Decision No. 11/2006).

Results

Lung function testing

The results of lung function assessment are shown in Table 1.

Land owned by farmers with COPD and by healthy farmers

Area of land owned by farmers with COPD (median: 1.5 hectares, 25th–75th percentile: 1.0–4.0 ha) was significantly lower than the area of farms belonging to healthy farmers (median:

7 ha, 25th–75th percentile: 3.0–10.0 ha) ($p < 0.0001$, Mann–Whitney U-test). The results are shown in Figure 2.

Discussion

Specific health issues of rural population have been neglected to a large extent both in the research literature as well as in the healthcare system design⁷⁰. Indeed, only few studies tackle the issue of COPD management in rural areas or analyze its links to the plethora of risk factors, such as poverty, usually connected to chronic conditions. This is surprising given the number of studies and reviews indicating the significant scale of the problem of COPD in farmers as well as its specificity^{15–26}. Characteristic occupational risk factors (such as organic dust exposure), followed by a prevalence of COPD have been well described in the literature¹⁸. Occupational factors are responsible for one-third of COPD cases in non-smokers^{12,13}. The presented study addresses the issue of socioeconomic status in COPD in rural areas. It shows that farmers with COPD in the Lublin region (south-east Poland) may be characterized as having significantly lower socioeconomic status. As shown by the study, farmers with COPD possess significantly smaller pieces of land than healthy farmers (Fig2). However, the study results should be assessed with regards to some limitations, including heterogeneity between the COPD and healthy farmers' groups (eg lower age in the control group, compared to COPD individuals).



Table 1: Lung function values in farmers with chronic obstructive pulmonary disease (according to GOLD) and in healthy farmers. Values expressed as mean \pm standard deviation.

Spirometric parameter	Farmers with COPD	Healthy farmers
Forced VC (L)	3.16 \pm 0.84	4.02 \pm 1.19
(% of normal values)	(86.29 \pm 18.13)	(104.32 \pm 19.75)
FEV1 (L)	1.98 \pm 0.75	3.19 \pm 0.95
(% of normal values)	(65.97 \pm 21.96)	(98.29 \pm 18.52)
FEV1/forced VC (%)	65.94 \pm 9.74	98.71 \pm 6.66

COPD, chronic obstructive pulmonary disease. FEV1, forced expiratory volume in first second. VC, vital capacity.

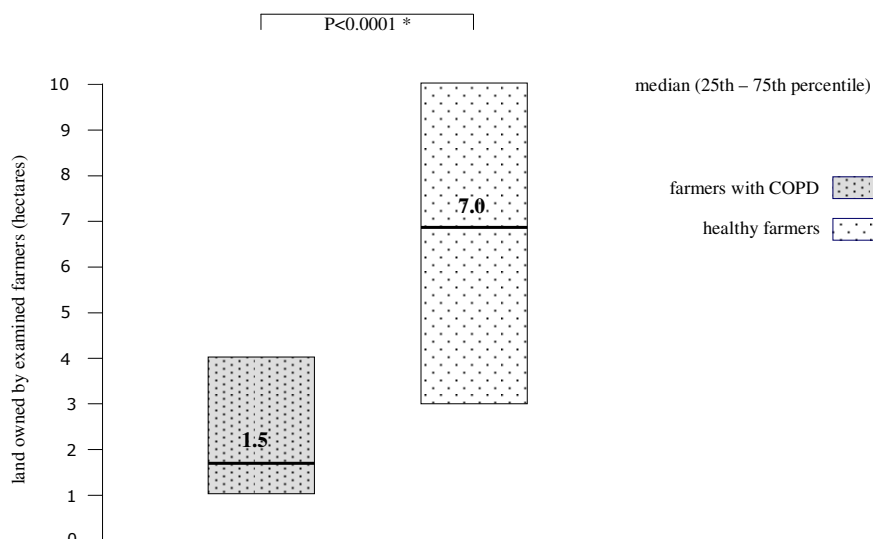


Figure 2: Area of farms owned by farmers with chronic obstructive pulmonary disease (COPD) and healthy farmers. (* Significant differences between groups, Mann–Whitney U-test, $p < 0.0001$).

The results of the presented study, conducted in one of the regions of Poland, a country of moderate climate in Central Europe, with a quite developed agricultural sector, are in line with outcomes of identified studies about the role of poverty in COPD patients in rural areas^{71,72}. Other studies show that poverty may be understood as an additional risk factor of chronic disease burden and as a cause determining other risk factors causing chronic conditions (eg tobacco smoking, the main source of COPD)⁵⁷. Usually studies tackling the issue of poverty have been undertaken in low-income countries⁷²; however, data from other high-income countries indicate that

chronic conditions and poverty are combined also in rich countries^{53,54,56}. Results of the study conducted in one of the most developed countries, Australia, reveal that poverty causes a decrease in quality of health services, even if these services are available⁷³. Furler et al. postulate special means to increase quality of services in disadvantaged areas (like strengthening community health services, health promotion or removing financial disincentives concerning long consultations)⁷³. According to these authors the number of general practitioners in disadvantaged rural areas should be



increased to keep quality of care equal to that of wealthy areas.

Access to health services of proper quality is a result of a complex interaction between the patient on one side and the provider and system on the other. The ability to use health services of a sufficient amount and quality by a given group of patients (eg COPD patients in rural areas, belonging to poorer farmers) depends on economic resources and health literacy and certain attitudes (eg patient conceptualization of health care and seeking or negotiating help)⁷⁴⁻⁷⁷. Thus, in order to increase quality of healthcare delivery in disadvantaged communities, special health system design is needed. Different solutions are being proposed (eg co-location of services) so that disadvantaged patients have a chance to receive primary, social and specialist care in one location⁷⁸.

The presence of competent, high-quality primary care seems to be the basis for proper COPD management. In rural areas⁷⁹ this is not so simple as the engagement of general practitioners in remote locations may be difficult⁵⁷. The role of competent nurses is also indicated^{80,81}. Further technological development (eg IT, telemedicine) should bring at least a partial solution to these issues⁸².

In certain rural areas chronic respiratory illnesses are not connected to poverty: Huhti et al. in their study conducted in Finland do not see any differences in socioeconomic status and chronic respiratory conditions⁸³.

Opinions about negative consequences of living in rural areas for patients with respiratory illnesses are though not shared by all authors. Iversen et al. show data of better respiratory health status of people from rural areas of Scotland than urban dwellers (lower prevalence of asthma and some respiratory conditions in countryside). However, Iversen et al. underline that COPD is excluded from this notice (according to the study prevalence of COPD is the same in rural and urban areas)⁸⁴.

According to the authors' knowledge this is the first study analyzing the issue of socioeconomic status in rural areas concerning COPD in Poland. The results obtained from the current study suggest that COPD affects poorer farmers (a limitation of the study might be defining the farmers' socioeconomic status based only on one parameter: area of possessed land). Social inequalities are a recognized reason for worse health status in Poland, including the Lublin region⁸⁵. The same is true for impairment of health services for poorer rural inhabitants⁶⁴. If COPD is indeed connected to poverty in rural areas in Poland then the healthcare system should be re-designed to address this issue and deliver relevant quality of care to this population. In cases of COPD a low level of care results in additional hospital treatment for exacerbations and thus the total cost of COPD management per patient increases dramatically^{86,87}.

Farmers with low socioeconomic status are taken care of in Poland: they are covered (basically for free) by the same coverage of health insurance as the rest of population. But health insurance coverage is not the only requirement to obtain sufficient healthcare services; there other issues: financial constraints, limited availability of providers, culturally inappropriate services (eg lack of IT literacy excludes some forms of care, eg telemonitoring)⁸⁸. Authors analysing other diseases (eg cancer) note that patients from rural areas tend to use health services insufficiently, have worse outcomes and meet difficulties in accessing health services^{89,90}. Probably due to its very nature (an ill person looking for services), the utilization of health services decreases with increasing distance of patients from healthcare facilities⁹¹. Addressing equity of health services for patients in rural, remote areas should be part of the scope of future reforms of modern healthcare systems⁹².

What is new for rural health? The study results show that, in Poland, COPD in rural areas affects the poorer parts of the population. Practical implications of the study outcome might be attempts to improve working conditions in smaller farms (lower exposure to organic dusts and other harmful occupational factors causing COPD) and paying special



attention to equity of access while dealing with COPD management in rural areas.

Conclusions

In rural areas individuals with COPD have a significantly lower socioeconomic status than healthy persons. Given that COPD is a major health problem, especially in rural areas, this may indicate that policy-makers should consider addressing equity in COPD management in rural areas.

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