

Urinary incontinence in adolescent females with cystic fibrosis in Poland

Research Article

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Abstract: Objectives. There have been many studies regarding urinary incontinence in cystic fibrosis females. However, no data concerning that issue was yet investigated in Poland. Methods. An anonymous questionnaire was sent by mail to all Polish cystic fibrosis females 16 years of age and older. Results. 64 patients responded to the questionnaire, 44% reported having urinary incontinence. Median age of onset of incontinence was 14.5 years. There were no differences in age, Body Mass Index (BMI), Forced expiratory volume in 1 second (FEV1), Cystic Fibrosis-Related Diabetes and Percutaneous Endoscopic Gastrostomy between continent and incontinent respondents. Significant correlations between urinary incontinence and number of respiratory exacerbations, sexual activity, and constipation were observed. No relationships between frequency and severity of urinary incontinence and form of chest physiotherapy, BMI and FEV1 were identified. Most respondents declared that urinary incontinence affected their daily life and prevented them from chest physiotherapy. Conclusions. Urinary incontinence should be identified and regarded with high priority in cystic fibrosis; health professionals should be aware that it is their responsibility to actively initiate discussion with patients of that subject in early adolescence.

Keywords: *Urinary incontinence • Cystic fibrosis • Adolescents*

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1. Introduction

Cystic fibrosis (CF) is the most common life threatening autosomal recessive genetic disease in Caucasians. Since the first description of the disease the outlook for patients has been impressively improved; life expectancy for individuals with CF doubled as compared with that of 20 years ago [1,2]. Improved survival and increase in the number population of teenagers and adults with CF have led to new unforeseen health problems like reproductive and sexual health issues and urinary incontinence (UI). Urinary incontinence is common in healthy

women and occurs with increased frequency in female adolescent and adult patients with chronic lung disease, including CF. Individuals with CF are deemed to have an increased risk of developing UI due to repeated coughing and other factors causing increased pressure on the pelvic floor.

There have been many studies in the world regarding UI in adolescent females with CF [3-6]. However in Poland, where we observe the improved life expectancy in these patients, there is no data regarding that issue.

The aim of this study was to investigate the prevalence and severity of UI in the population of Polish female

adolescents with CF and its association with severity of lung disease and its impact on daily life and personal health care, especially regarding physiotherapy.

2. Materials and methods

The anonymous questionnaires were sent by mail to all registered at Polish National CF Registry adolescent females. Total sample consisted of 120 patients, aged 16 years and older. The questionnaire was developed and adopted from previous studies of Nixon *et al*, [5] based on the known and anticipated UI problems faced by women with CF. A group of 10 adolescent females with CF was convened to test face validity. Those questionnaires were validated by checking the logical consistency of individual questions, and different wording was used if necessary. The questionnaire was developed to assess demographic and clinical data including prevalence, severity, and impact of urinary incontinence. Demographic and clinical data included age, weight, height, lung function (forced expiratory volume in 1 second (FEV1) in the previous 6 months), number of respiratory exacerbations in the previous 12 months, type and frequency of chest physiotherapy and coexistence of Cystic Fibrosis-Related Diabetes (CFRD) and Percutaneous Endoscopic Gastrostomy (PEG). All data was collected from the patient responses to above specified questions except Body Mass Index (BMI), which was calculated by medical staff.

The study was approved by the Medical University of Lodz, Poland – ethics committee.

3. Statistical analysis

Continuous variables exhibiting a heavily skewed distribution were compared with Mann-Whitney or Kruskal-Wallis test. Proportions were compared with

Z-test adjusted for multiple comparisons using Benferroni correction or with Pearson Chi-Square tests. Associations between dichotomized variable and group of independent variables were analyzed in logistic regression model. Also linear correlations using Spearman's test were estimated. All analyses were performed with statistical significance set at 5%.

4. Results

Sixty four patients (aged 16-24 years, mean $\pm$ SD; 20.94 $\pm$ 1.49) responded to the questionnaire. According to data from Polish Cystic Fibrosis Registry this includes 50.7% of all registered female patients in Poland over 16 years old, and 72% of female CF patients between age 16 and 24. The mean FEV1% of predicted was 50.48 $\pm$ 17.01 with range 29-97% and mean BMI was 18.2 $\pm$ 1.43 with range 14.5-21.4 kg/m². Sixty (94%) adolescents were post-menarchal, with the mean age of menarche 15.3 $\pm$ 1.6 years with range 12-19 years. Of 64 patients, 44 (68%) started sexual intercourse, and the mean age at onset of sexual intercourse was 19.2 $\pm$ 1.56 years.

Twenty eight respondents (44%) reported being urine incontinent. There were no differences in age, BMI, FEV1, CFRD and PEG between continent and incontinent respondents. Significant correlations between UI and number of respiratory exacerbations, sexual activity and constipation were observed. Respiratory exacerbations and constipation identified a group at a higher risk for incontinence; decreased prevalence of UI was observed in sexually active respondents. Characteristic of continent and incontinent respondents is presented in Table 1. Incontinence was reported once a year or more in 24 (86%) of those who reported ever being incontinent. Median age of onset of incontinence was 14.5 years (range: 12–17).

Table 1. Characteristics of Incontinent and Continent Adolescents

	Incontinent (n 28)	Continent (n 36)	P Value
Age (y)*	20,4 $\pm$ 2,14	21,2 $\pm$ 1,86	0,89
BMI (kg/m2) *	18,6 $\pm$ 1,52	19,1 $\pm$ 1,87	0,75
FEV1 (% predicted) *	48,7 $\pm$ 16,15	52,9 $\pm$ 17,23	0,33
Number of exacerbations per year	2,4	1,5	0,04
CF-related diabetes (n)	3	7	0,57
Gastrostomy in situ (n)	5	10	0,19
Constipation more than occasionally (n)	10	2	0,02
Sexual active (n)	14	30	0,04

BMI–body mass index; FEV1- forced expiratory volume in 1 second;

* Values are reported as mean with standard deviation

Of those who reported incontinence once a year or more, 14 (50%) were sexually active; 58% described moderate incontinence (“wet/a small amount”) and 38% small-volume incontinence (“damp/a few drops”). No relationships between frequency and severity of UI and form of chest physiotherapy were identified. Additionally we observed no correlation between BMI and FEV1 and frequency and severity of UI. Sneezing (100%), coughing “fits” (96%), lifting things (92%) and laughing (92%) were the most commonly identified causes of incontinence with chest physiotherapy (71%) being a less common cause.

Most respondents declared that their incontinence affects their daily life. Holidays, social life, school/work and interests/hobbies were affected “a little bit” and “a fair bit” in than half of the respondents (range 50-58%). From 29% to 42% of respondents reported that their social life, school/work and intimate relationships are affected “a lot” and “most of the time”.

Almost a half of the respondents declared that UI “sometimes”, and 25% that “about half the time” and “most of the time” prevented them from chest physiotherapy. Respondents with lower BMI values and those who reported moderate/severe UI more frequently avoided chest physiotherapy. Using sanitary pads (75%), passing urine before chest physiotherapy (67%) and reducing fluid intake (67%) were the most common behavior modifications made in response to incontinence. Fifty percent of respondents had not told anyone about UI, 23% told CF friends about UI problem and 33% had discussed that issue with their CF doctor. Severity of UI was identified as a factor which influenced the frequency of CF doctor consultations. Seventy five percent of those who reported incontinence once a year or more knew that treatment is available for urinary incontinence, and 25% had received pelvic floor exercises, 29% had been referred to specialists for investigation and treatment. No participant received pharmacological treatment.

5. Discussion

Urinary incontinence (UI) is recognized as a significant problem in young, middle-aged and adult female CF patients. There have been many studies regarding UI issues in populations of women with CF. Most of them reported a much higher prevalence of incontinence in the CF population than in healthy young people [4,6,7], but some authors reported that incidence of urinary incontinence is no different between adolescents with CF, and controls [3]. We authors realize, that the lack of a control group is the main limitation of this study,

nevertheless, our results highlight that the UI prevalence is very high in Polish female adolescents with CF. In this study, we examined factors that might contribute to the development of urinary incontinence in CF female patients: age, BMI, FEV1, chest physiotherapy, number of pulmonary exacerbations, sexual activity, PEG, CFRD and constipation. Only number of pulmonary exacerbations, constipation, and sexual activity were identified as being associated with incontinence. In few studies incontinent patients were shown to have more severe lung disease (FEV1) than continent ones [4,8,9]. However, other authors described no significant difference in lung disease severity between both groups of patients [5,10]. It is difficult to draw conclusions relating to the influence of lung disease severity to UI prevalence due to the different methodologies used and different studies of CF populations. We could speculate that stage of CF related to age of described patients can be responsible for such differences; relationships between UI and severity of lung disease were described mainly in older patients. We showed that the number of pulmonary exacerbations is associated with incontinence. Pulmonary exacerbations are associated with more severe cough, more sputum production and intense inflammatory processes. UI is reportedly worse during an acute pulmonary exacerbation [5,8,11]. Cough is a known as a major cause of UI in CF. Additionally increased levels of pro-inflammatory cytokines during pulmonary exacerbation may contribute in reduced pelvic floor muscle (PFM) strength. Based on some studies it has been suggested that peripheral muscle force might be negatively related to the inflammatory state in patients with COPD [12]. Pinet *et al.* demonstrated that inflammatory markers would not adversely affect muscle strength in patients with CF, however, this study may not reflect the findings in the pulmonary exacerbation; that study was conducted on clinically stable patients [13]. Constipation is a known risk factor for failure of the continence mechanism [14-16]. Many studies of large populations of women demonstrated considerable impact of constipation on incontinence in women [16-18]. Constipation and its complications are a management problem in CF due to gastro-intestinal pathology [19]. CF patients with constipation first should be informed about adequate fluid and fiber intake and then – in the case of failure of the dietary intervention – pharmacological treatment should be implemented. In CF patients it is generally recommended to start with an oral laxative (polyethylene glycol) [20].

There have been many studies regarding relationship between UI and sexual activity and satisfaction. Most of them showed that UI adversely affects women's sexual life, mental health, and social life [21-23]. We

observed decreased prevalence of UI in sexually active respondents. The strength of pelvic floor muscle (PFM) plays an important role in the continence mechanism and there are only a few studies in the literature regarding the association between PFM strength and sexual function [24,25]. Lowenstein *et al.* described the association between PFM strength and sexual functioning [26] suggesting that orgasm and arousal function are related to better PFM function.

Our results showed influence of UI on social life in women with CF but most of respondents declared that their daily lives were not significantly affected by incontinence. Those results are consistent with the findings of most data from CF population but significantly differ of those of large populations of adult women with CF. Many data demonstrate considerable impact of UI on daily activities and quality of life [27,28].

Relationship between chest physiotherapy and UI is an important problem in the context of CF management—chest physiotherapy is an integral part of the bronchopulmonary disease treatment in CF. Our findings showed that most of respondents declared that UI stopped them from chest physiotherapy but we observed no relationships between frequency and severity of UI and form of chest physiotherapy. It is known that all types of physiotherapy provoke coughing and are the cause of increased abdominal pressure and that is why chest physiotherapy in general predisposes to UI. Certainly additional studies on larger patients groups are needed to evaluate the relationship between specific forms of chest physiotherapy and UI. That information will allow for the optimization of treatment. We showed that only 33% of patients had discussed UI issues with their CF doctor. Those results unambiguously indicate the necessity of implementation of education and prevention strategies for CF patients. Additionally our study

showed that 75% of respondents knew that treatment was available for urinary incontinence but only a minority of them asked for professional help. Pelvic floor muscle training is recommended as first line treatment for UI. It is worth noting that currently the development of imaging techniques provide detailed diagnostic possibilities and procedure planning, for example four dimensional (4D) real-time imaging allows the investigator to obtain a dynamic assessment of the pelvic floor [29]. There is evidence that physical therapies, particularly PFM exercises, are effective in treating stress UI [30]. However some studies showed that in CF patients these treatments can be burdensome and also adherence is poor [31]. In the cases where standard physiotherapy has not resulted in a significant improvement, surgical treatment should be considered [32].

6. Conclusions

Urinary incontinence is a treatable and preventable condition that has many adverse physical and psychological effects. UI should be identified and treated with high priority in CF patients; health professionals should be aware that it is their responsibility to actively initiate discussions with CF patients in early adolescence. This study is the first published in Poland with data concerning UI in Polish CF female patients. It should be understood to be a pilot, and further urodynamic studies with control groups included are needed.

Conflict of interest statement

Authors declare no conflict of interest.

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References

- [1] Elborn J.S., Shale D.J., Britton J.R. Cystic fibrosis: current survival and population estimates to the year 2000, *Thorax*, 1991, 46, 881-885
- [2] Mehta G., Macek M. Jr, Mehta A. European Registry Working Group. Cystic fibrosis across Europe: EuroCareCF analysis of demographic data from 35 countries, *J. Cyst. Fibros.*, 2010, 9 Suppl 2, S5-S21
- [3] Browne W.J., Wood C.J., Desai M., Weller P.H. Urinary incontinence in 9-16 year olds with cystic fibrosis compared to other respiratory conditions and a normal group, *J. Cyst. Fibros.*, 2009, 8(1), 50-57
- [4] Prasad S.A., Balfour-Lynn I.M., Carr S.B., Madge S.L. A comparison of the prevalence of urinary incontinence in girls with cystic fibrosis, asthma, and healthy controls, *Pediatr. Pulmonol.*, 2006, 41(11), 1065-1068
- [5] Nixon G.M., Glazner J.A., Martin J.M., Sawyer S.M. Urinary incontinence in female adolescents with cystic fibrosis, *Pediatrics* 2002, 110(2 Pt 1), e22
- [6] Nankivell G., Caldwell P., Follett J. Urinary incontinence in adolescent females with cystic fibrosis, *Paediatr. Respir. Rev.*, 2010, 11(2), 95-99
- [7] Vella M., Cartwright R., Cardozo L., Parsons M., Madge S., Burns Y. Prevalence of incontinence

- and incontinence-specific quality of life impairment in women with cystic fibrosis, *Neurourol. Urodyn.*, 2009, 28(8), 986-989
- [8] Cornacchia M., Zenorini A., Perobelli S., Zanolla L., Mastella G., Braggion C. Prevalence of urinary incontinence in women with cystic fibrosis. *BJU Int.*, 2001, 88, 44-48
- [9] White K., Stiller K., Roney F. The prevalence and severity of symptoms of incontinence in adult cystic fibrosis patients, *Physiother. Theory. Pract.*, 2000, 16, 35-42
- [10] Blackwell K., Malone P.S., Denny A., Connett G., Maddison J. The prevalence of stress urinary incontinence in patients with cystic fibrosis: an under-recognized problem, *J. Pediatr. Urol.*, 2005, 1(1), 5-9
- [11] Orr A., McVean R.J., Webb A.K., Dodd M.E. Questionnaire survey of urinary incontinence in women with cystic fibrosis, *BMJ*, 2001, 322(7301), 1521
- [12] Spruit M.A., Grosselink R., Troosters T., Kasran A., Gayan-Ramirez G., Bogaerts P., et al., Muscle force during an acute exacerbation in hospitalised patients with COPD and its relationship with CXCL8 and IGF-1, *Thorax* 2003, 58, 752-756
- [13] Pinet C., Cassart M., Scillia P., Lamotte M., Knoop C., Casimir G., et al., Function and bulk of respiratory and limb muscles in patients with cystic fibrosis, *Am. J. Respir. Crit. Care. Med.*, 2003, 168(8), 989-994
- [14] Mantle J. Focus on incontinence, *Physiotherapy*, 1994, 80, 126-131
- [15] Dodd M.E., Langman H. Urinary incontinence in cystic fibrosis, *J. R. Soc. Med.*, 2005, 98 Suppl 45, 28-36
- [16] Chiarelli P., Brown W., McElduff P. Leaking urine: Prevalence and associated factors in Australian women, *Neurol. Urodyn.*, 1999, 18, 567-577
- [17] Bodhare T.N., Valsangkar S., Bele S.D. An epidemiological study of urinary incontinence and its impact on quality of life among women aged 35 years and above in a rural area, *Indian. J. Urol.*, 2010, 26(3), 353-358
- [18] Wyndaele M., De Winter B.Y., Pelckmans P., Wyndaele J.J. Lower bowel function in urinary incontinent women, urinary continent women and in controls, *Neurourol. Urodyn.*, 2011, 30(1), 138-143
- [19] D Houwen R.H., van der Doef H.P., Sermet I., Munck A., Hauser B., Walkowiak J., et al., Defining DIOS and constipation in cystic fibrosis with a multicentre study on the incidence, characteristics, and treatment of DIOS, *J. Pediatr. Gastroenterol. Nutr.*, 2010, 50(1), 38-42
- [20] van der Doef H.P., Kokke F.T., van der Ent C.K., Houwen R.H. Intestinal obstruction syndromes in cystic fibrosis: meconium ileus, distal intestinal obstruction syndrome, and constipation, *Curr. Gastroenterol. Rep.*, 2011, 13(3), 265-270
- [21] Nilsson M., Lalos O., Lindkvist H., Lalos A. Impact of female urinary incontinence and urgency on women's and their partners' sexual life, *Neurourol. Urodyn.*, 2011, 30(7), 1276-1280
- [22] Sirls L.T., Tennstedt S., Albo M., Chai T., Kenton K., Huang L., et al., Factors associated with quality of life in women undergoing surgery for stress urinary incontinence, *J. Urol.*, 2010, 184(6), 2411-2415
- [23] Rivalta M., Sighinolfi M.C., Micali S., De Stefani S., Bianchi G. Sexual Function and Quality of Life in Women with Urinary Incontinence Treated by a Complete Pelvic Floor Rehabilitation Program (Biofeedback, Functional Electrical Stimulation, Pelvic Floor Muscles Exercises, and Vaginal Cones), *J. Sex. Med.*, 2010, 7, 1200-1208
- [24] Shafik A. The role of the levator ani muscle in evacuation, sexual performance and pelvic floor disorders, *Int. Urogynecol. J. Pelvic. Floor. Dysfunct.*, 2000, 11(6), 361-376
- [25] Lukacz E.S., Whitcomb E.L., Lawrence J.M., Nager C.W., Contreras R., Luber KM. Are sexual activity and satisfaction affected by pelvic floor disorders? Analysis of a community-based survey, *Am. J. Obstet. Gynecol.*, 2007, 197(1), 88.e1-6
- [26] Lowenstein L., Gruenwald I., Gartman I., Vardi Y. Can stronger pelvic muscle floor improve sexual function?, *Int. Urogynecol. J. Pelvic. Floor. Dysfunct.*, 2010, 21(5), 553-556
- [27] Botlero R., Davis S.R., Urquhart D.M., Bell R.J. Incidence and Resolution Rates of Different Types of Urinary Incontinence in Women: Findings From a Cohort Study, *J. Urol.*, 2011, 185(4), 1331-1337
- [28] Riss P., Kargl J. Quality of life and urinary incontinence in women, *Maturitas* 2011, 68(2), 137-142
- [29] Steensma AB. Ultrasound Imaging of the Pelvic Floor: linking anatomical findings with clinical symptoms, The Netherlands, 2009. http://repub.eur.nl/res/pub/18053/090623_Steensma,%20Anneke%20Baukje.pdf (accessed 21th Dec 2012)
- [30] Rosenbaum T.Y. Pelvic floor physiotherapy for women with urogenital dysfunction: indications and methods, *Minerva. Urol. Nefrol.*, 2011, 63(1), 101-107
- [31] McVean R.J., Orr A., Webb A.K., Bradbury A., Kay L., Philips E., et al., Treatment of urinary incontinence in cystic fibrosis, *J. Cyst. Fibros.* 2003, 2, 171-176

- [32] Helm J.M., Langman H., Dodd M.E., Ahluwalia A., Jones A.M., Webb A.K. A novel solution for severe urinary incontinence in women with cystic fibrosis, *J. Cyst. Fibros.*, 2008, 7(6), 501-504