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ORIGINAL REPORT

POLIO AND POST-POLIO SYNDROME IN NON-WESTERN IMMIGRANTS: A NEW CHALLENGE FOR THE HEALTHCARE SYSTEM IN NORWAY

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Objective: **To explore the health situation and identify specific health challenges in non-Western immigrants with polio in Norway, by comparing their status with Western immigrants with polio and native Norwegians with polio.**

Design: **A questionnaire covering demographics, polio history, life satisfaction, medical, psychological and social conditions was answered by 1,408 persons with polio, among them 34 immigrants from non-Western countries and 32 immigrants from Western countries.**

Results: **The non-Western immigrant polio group had a mean age of 46 years, were highly educated, reported high frequency of mental health problems and only one-third was working. Mean age for contracting polio was 2.8 years. Only 30% was hospitalized in the acute phase and 80% reported severe leg weakness. Use of a powered wheelchair was reported by 72%. Post-polio symptoms had started at a mean age of 31 years. The non-Western immigrant group reported more fatigue, pain and loneliness, and a high proportion reported insufficient assistance from the public health system.**

Conclusion: **The group of non-Western immigrants with polio in Norway reported more health and social problems than the group of Western immigrants with polio or the native Norwegian group with polio, even though they were younger and more highly educated. Their complex psychological and social situation requires active intervention from the health system, and health professionals need extra skills to deal most effectively with their situation.**

Key words: polio; poliomyelitis; post-polio syndrome; immigrants; non-Western; health; social conditions; psycho-social health.

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LAY ABSTRACT

Immigrants with polio coming to Norway are younger and have a different medical history, social background and health challenges than native Norwegian polio-injured subjects. The aim of this study was to explore the health situation among non-Western immigrants to Norway with polio. A questionnaire covering demographics, polio history, life satisfaction, medical, psychological and social conditions was answered by 34 immigrants from non-Western countries, and compared to Western immigrants with polio and native Norwegians with polio. The immigrant polio group was highly educated, reported a high frequency of mental health problems, and one-third was working. Not more than one-third was hospitalized in the acute phase. The immigrant polio group reported more fatigue, pain and loneliness than the native Norwegian patients. Use of a wheelchair was reported by 7 out of 10, and a high percentage reported insufficient assistance from the public health system. The complex psychological and social situation for non-Western immigrants with polio requires extra consideration from the health system, and health professionals need specialized information in order to provide the most appropriate treatment for these patients.

Poliomyelitis is a viral disease that still represents a major challenge for individuals and healthcare services worldwide. Poliovirus enters the bloodstream from the intestine in 1–5% of those infected and invades the spinal cord, where 90% of the anterior horn cells have to be infected to cause paralytic poliomyelitis. Symptoms are fever, headache, irritability, and localized paralysis. Motor nerve cells, but not the sensory nerve cells, are impaired or destroyed (1, 2).

The introduction of poliovirus vaccines in 1955 led to a sharp reduction in poliomyelitis in the industrialized countries, but not necessarily throughout the world (3). Thus, the majority of individuals living with late effects of poliomyelitis in Western countries are middle-aged to elderly (4). In tropical and subtropical regions, poliovirus can survive all year round, leading to relatively constant incidence rates, which present as endemic disease, in contrast to noticeable epidemics. Combined with high infant mortality rates, endemic polio was largely overlooked and not recognized as a major challenge, until surveys conducted during the 1970s documented its high prevalence (5). Vaccination was introduced worldwide as part of national and World Health Organization (WHO) immunization programmes, and resulted in a 99% reduction, from an estimated 350,000–400,000 paralytic cases per year, to

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a worldwide total of only 396 new polio cases in the period 2014–17 (6). In 2019, Afghanistan and Pakistan are the only 2 endemic countries in which wild polio virus (WPV) transmission continues to be reported, with 34 cases, while 104 vaccine-derived cases (cVDPV) occurred in Nigeria and in non-endemic countries (6). Political conflicts and instability, combined with poor infrastructure and scepticism about Western health authorities and vaccines in some regions, continue to pose challenges to the eradication of the disease (3, 7).

Disability as a result of polio still has profound social and economic consequences regarding employment, social class, income and marital status in developing countries (8, 9). The largest and youngest populations of people with polio today, approximately 4–5 million persons, live in non-industrialized developing countries, and many are children or of prime working age. Furthermore, polio occurs disproportionately amongst the poorest and most marginalized populations, especially girls. They are the least likely to have received vaccines and often lack access to medical and rehabilitation programmes, job training, employment and social support (10).

Persons with poliomyelitis from developing countries face multiple challenges when being referred to medical treatment in Western countries. Non-Western immigrants often have a complex psychosocial background, with little or inadequate treatment in the acute and rehabilitation phase (11). Qualitative studies in immigrant polio patients illustrate challenges associated with physical capacity, occupational performance, and strategies to gain respect and take an active part in a new and foreign society (12–14).

The main aim of this study was to identify the specific challenges, regarding physical, mental and social functioning, for non-Western immigrants to Norway with previous polio. The findings were compared with similar functions in Western immigrants with polio, and with the findings of a previous study including native Norwegian polio survivors (15). The results should therefore elucidate the specific needs of immigrant polio patients.

METHODS

This study is based on a questionnaire that was distributed in January 2014 to all registered members of the Norwegian Association of Polio Survivors (LFPS) ($n = 1{,}998$). One reminder was forwarded by post to non-responders. The response rate was 72%. The same questionnaire was sent to non-LFPS members with a polio diagnosis, who were registered by the South-Eastern Norway Health Authority 2010–14 ($n = 152$). These subjects were also reminded once (15). A web-link was set up (www.tns-gallup.no/polio2014) and the survey was advertised on social media, resulting in 23 additional responders.

From the 1,408 persons who completed and returned the questionnaire, those who stated that they were born outside Norway and who had acquired their acute poliomyelitis in that country (a total of 66 persons) were selected. This immigrant group was divided into 2: immigrants from non-Western developing countries (34 persons) and Western immigrants from developed countries (32 persons).

The non-Western immigrant group comprised 11 men and 20 women; 3 persons did not answer the question regarding sex. They were all born in developing countries where poliomyelitis was endemic until the 1980s. The Western immigrant study group comprised 11 men and 21 women, from 14 countries in Europe, plus 5 from the USA (Table I). Two Western immigrants did not state their country of origin. No information was available on age at immigration to Norway.

The reference group, or native Norwegian polio group, included 1,342 persons.

Measurements

The questionnaire included 87 items, covering a wide range of demographic, medical and psychosocial factors and data from the acute, rehabilitation and late phase of polio. The questionnaire was designed by the Norwegian Society of Polio Survivors in collaboration with researchers, and based on earlier surveys (16, 17).The following assessments were included:

Quality of life. Two questions from the quality of life scale LISAT-11 (18) were included, asking how the respondents perceived their physical and psychological health on a 7-point scale, ranging from "very unsatisfactory" to "very satisfactory", including the category "not relevant".

Concomitant disease. A questionnaire containing 19 dichotomized questions (yes/no) regarding concomitant diseases was derived from a large-scale Norwegian population study (19), and the results were compared with a study on immigrant health in Norway (20).

Table I. Continent and country of origin for non-Western and Western immigrant participants

Non-Western immigrants with polio ($n = 34$)			Western immigrants with polio ($n = 32$)		
Continent of origin	Country of origin	*n*	Continent of origin	Country of origin	*n*
South America	Mexico	1	USA		5
	Peru	1	Europe	Germany	2
	Chile	1		England	2
Africa	Sierra Leone	1		Denmark	5
	Somalia	1		Sweden	6
	Uganda	1		Switzerland	1
	Burundi	1		Austria	1
	Madagascar	1		Island	1
	Eritrea	1		Kosovo	1
	Ethiopia	2		Belgium	2
	Gambia	1		Bosnia	2
Asia	India	3		Scotland	1
	Iran	2		Netherlands	1
	Cambodia	1		Unknown foreign country	2
	Korea	5			
	Afghanistan	1			
	Vietnam	2			
	Myanmar	1			
Middle East	Syria	2			
	Tunisia	1			
	Morocco	1			
	Iraq	2			
	Lebanon	1			

Resilience. The Resilience Scale for Adults (RSA) is a self-report scale designed to measure factors associated with resilience in 3 resource domains; dispositional, social and external (21). RSA consists of 33 items grouped into 5 factors: 1) Personal strength contains 2 primary factors: 1A. Perception of self, and 1B. Perception of future; 2) Social competence; 3) Family cohesion; 4) Social resources; and 5) Structured style. Each item was scored on a 5-point semantic scale, the total score ranging from 33 to 165. RSA has been tested in both Western and non-Western populations and shows stability in different cultural contexts (22).

Pain. The respondents estimated mean pain over the previous week on a visual analogue scale, ranging from 0=no pain to 10=unbearable pain.

Fatigue. The Fatigue Severity Scale (FSS) includes 9 statements assessing perceived fatigue. Each statement was rated on a scale from 1="strong disagreement" to 7="strong agreement". The individual score is the mean of all numerical responses, i.e. a maximum score of 7. Severe fatigue was defined as scores >5, and moderate fatigue scores 4.0–4.9 (23).

Body mass index. BMI is calculated as weight (in kg)/(height (in m))^2. Normal body weight was defined in the range 19–25 kg/m^2 in persons age <70 years, while in persons >70 years the normal range was 22–24 kg/m^2 (lower limit) and 27–29 kg/m^2 (upper limit) (24).

Statistical analysis

The results are generally presented as descriptive statistics, analysed using IBM SPSS Statistics version 25 (IBM, Armonk, New York, USA). Differences between the 3 polio groups were tested with Pearson's χ^2 tests for nominal data and with 1-way analysis of variance to compare the means for interval data. The chosen level of significance was $p<0.05$. No adjustments were made for multiple comparisons.

RESULTS

The findings from the immigrant polio groups and the native Norwegian polio group are shown in Tables II–V. We have mainly compared the findings with those from our survey on health and social conditions in Norwegian polio survivors from 2016 (15), but some variables were also compared with the general immigrant population from non-Western countries to Norway (19, 20).

The non-Western polio group was significantly younger than the 2 other polio groups, with a mean age of 46 years (range 18–61 years). The mean age of the Western immigrant group was similar to that of the native Norwegian group, i.e. 71 years. The male/female ratio was the same in all groups, with twice as many women as men. The non-Western immigrant group was significantly more highly educated; 43% reported more than 12 years of education, compared with 33% in the Western immigrant group and 26% in the native Norwegian group. Thirty-one percent of the non-Western immigrants were working full-time or part-time. The majority (60–70%) of people in the other 2 groups were retired. A high percentage (41%) of subjects in the non-Western immigrant group received disability pension, and 33% had an annual gross income of <50% of the mean household income in Norway (Table II).

In the non-Western immigrant group, the mean age for contracting polio was 2.8 years (range 0–11 years), with no significant sex difference, compared with 5.1 years in the Western immigrant group and 6.2 years in the native Norwegian group. Only 30% of subjects in the non-Western immigrant group were hospitalized in the acute phase, compared with 60% and 62% in the Western immigrant and native Norwegian groups ($p=0.002$) (Table III). Furthermore, 71% of subjects in the non-Western group reported no hospitalization in the rehabilitation phase, and 80% reported no surgical or corrective operations due to their polio.

The main localization of chronic polio paresis in all groups was the lower limbs, resulting in moderate

Table II. Demographic characteristics, length of education and employment status of subjects with late effects of polio

	Non-Western immigrant polio group ($n=34$)	Western immigrant polio group ($n=32$)	Native Norwegian polio group ($n=1,342$)	*p*-value
Sex, %	36/65	28/72	31/66	n.s
male/female ($n=31/32/1,307$)	11/20	11/21	416/891	
Age, years ($n=32/32/1,309$), mean (SD)	45.7 (10.7)	71.5 (8.4)	70.8 (7.8)	0.000
Education ($n=30/30/1,240$), %				
1–9 years	10.0	6.7	21.9	0.040
10–12 years	46.7	60.0	52.6	0.582
>12 years	43.3	33.3	25.5	0.058
Employment ($n=29/31/1,173$), %				
Work, full-time	17.2	0	5.2	0.007
Work, part-time	13.8	3.2	3.5	0.015
Disability pension	41.4	12.9	27.3	0.046
Retirement	0	71.0	60.8	0.000
Other	27.4	13.0	3.2	0.000
Married/cohabitant ($n=32/31/1,299$), %	78.1	74.2	65.1	0.309
Annual income less than 50% of mean[a,b] ($n=30/29/1,312$), %	33.3	10.3	10.3	0.001

SD: standard deviation. Numbers of respondents (n) are given for each variable. [a]Unknown=missing data. [b]Total gross household income in relation to income and wealth statistics for households; Statistics Norway 2014 (37).

Table III. Physical characteristics, health-related symptoms and use of technical aids

	Non-western immigrant polio group ($n = 34$)	Western immigrant polio group ($n = 32$)	Native Norwegian polio group $n = 1,342$)	p-value
Age at onset of polio, years ($n = 33/32/1,215$), mean (SD)	2.8 (2.1)	5.1 (1.3)	6.2 (5.8)	0.021
Hospitalized acute phase ($n = 30/30/1,270$), %	30.0	60.0	61.7	0.002
Acute moderate/complete paresis, %				
Legs/hips ($n = 31/29/1,145$)	82.8	57.1	69.8	0.109
Arms/shoulders ($n = 23/25/1,030$)	33.3	38.1	42.1	0.713
Respiratory muscles (some/great) ($n = 21/22/943$)	8.3	5.9	10.8	0.781
Present moderate/complete paresis, %				
Legs/hips ($n = 29/32/1,151$)	72.4	28.6	31.5	0.000
Arms/shoulders ($n = 23/25/1,030$)	14.3	8.7	13.1	0.813
Respiratory muscles (some/great) ($n = 21/22/943$)	0	0	2.9	0.570
Current use of technical aids[a], %				
Electrical wheelchair ($n = 25/32/1,023$)	72.0	26.1	31.4	0.000
Manual wheelchair ($n = 21/23/996$)	57.1	27.3	28.3	0.016
Assistive aids for hands/arms ($n = 20/26/985$)	15.0	12.0	17.4	0.753
Respiratory aid ($n = 17/32/980$)	0	13.0	14.5	0.233
Need for help with personal hygiene ($n = 26/24/1,099$), %	11.5	4.2	9.5	0.632

SD: standard deviation. Numbers of respondents (n) are given for each variable. [a](when needed).

or complete paresis in the hips and legs in 72% of the non-Western immigrant group, compared with 29% of the Western immigrant group and 32% of the native Norwegian group. A higher number in the non-Western group also reported paresis in the legs in the acute phase (Table III).

More than 90% in all 3 groups reported new muscular weakness and loss of muscle volume. New muscular weakness was reported more often by women than by men. It was reported to occur at a mean age of 27 years in the non-Western immigrant group vs 48 and 46 years in the Western immigrant and Norwegian polio groups, respectively. In the non-Western immigrant group, 79% (vs 100% and 93% in the Western immigrant and Norwegian polio groups, respectively) reported that they thought they had post-polio syndrome. This occurred at the mean age of 34 years, in contrast to 53 and 48 years in the other 2 groups.

In the non-Western immigrant group, 72% reported using a powered wheelchair, compared with 26% and 31% in the other 2 groups. More men than women reported using a wheelchair. Use of a manual wheelchair was reported more than twice as often in the non-Western immigrant group (Table III). A similar proportion in all groups (<20 %) received daily assistance from the public health system, 43% in the non-Western immigrant group reported that this help did not cover their needs, compared to 30% in the Western immigrant group and 21% in the native Norwegian group.

Differences in Fatigue Severity Scale (FSS), pain, body mass index (BMI), use of medication, smoking and exercise in the immigrant and the native polio groups, are shown in Table IV.

The non-Western immigrant group reported a mean FSS score equivalent to severe fatigue, while the Western immigrant and native Norwegian polio groups reported significantly lower fatigue. The non-Western immigrant group reported pain with significantly higher intensity on the VAS scale. The non-Western group used less medication and alcohol and 52% were not satisfied with the treatment and follow-up of their pain. Mean BMI was within the normal range in all 3 groups. The 2 immigrant groups were less satisfied with their physical health than the native Norwegian

Table IV. Health-related characteristics of subjects with late effects of polio

	Non-western immigrant polio group ($n = 34$)	Western immigrant polio group ($n = 32$)	Native Norwegian polio group ($n = 1,342$)	p-value
FSS ($n = 28/25/1,083$), mean (SD)	5.5 (1.6)	5.1 (1.3)	4.7 (1.5)	0.011
Pain VAS scale 1–10 ($n = 33/31/1,241$), mean (SD)	6.9 (2.6)	6.3 (2.4)	5.3 (2.5)	0.000
BMI ($n = 30/31/11,254$), mean (SD)	26.3 (5.3)	25.0 (4.4)	26.8 (8.7)	0.498
Number of concomitant diseases ($n = 34/32/1,342$), mean (SD)	1.6 (1.7)	3.1 (1.7)	2.0 (1.7)	0.000
Regularly use of medication, %				
Analgesics ($n = 31/30/1,150$)	61.3	73.3	71.9	0.423
Sleep medication ($n = 28/28/1,060$)	17.9	35.7	35.3	0.161
Sedatives ($n = 27/27/994$)	14.8	22.2	19.8	0.770
Unsatisfactory physical health ($n = 28/31/1,305$), %	56.7	58.1	41.3	0.046
Daily smoking ($n = 33/32/1,283$), %	9.1	18.8	12.0	0.444
Exercising rarely or never ($n = 32/30/1,248$), %	68.8	50.0	52.7	0.189
Not satisfied with the help from public health system ($n = 21/20/615$), %	42.9	30.0	20.5	0.032

SD: standard deviation. Numbers of respondents (n) are given for each variable. FSS: Fatigue Severity Scale; VAS: visual analogue scale; BMI total: body mass index (weight/height^2).

Table V. Psycho-social characteristics of subjects with late effects of polio

	Non-western immigrant polio group ($n=34$)	Western immigrant polio group ($n=32$)	Native Norwegian polio group ($n=1,342$)	p-value χ^2
Unsatisfactory psychological health ($n=30/31/1,247$), %	40.0	19.4	11.1	0.000
Psychological problems in need of professional help ($n=30/32/1,219$), %	30.0	29.0	16.8	0.040
RSA total[a] ($n=30/996$), mean (SD)	3.9 (0.6)	3.8 (0.5)	3.9 (0.5)	0.936
Factor 1 A: Perception of self (6 items)	3.7 (0.9)	3.6 (0.9)	3.9 (0.8)	0.102
Factor 1 B: Perception of future (4 items)	3.1 (1.2)	2.9 (1.1)	3.2 (1.0)	0.126
Factor 2: Social competence (6 items)	3.9 (0.9)	3.8 (0.9)	3.8 (0.8)	0.891
Factor 3: Family cohesion (6 items)	3.9 (0.8)	4.1 (0.8)	4.1 (0.7)	0.410
Factor 4: Social resources (7 items)	4.0 (0.9)	4.4 (0.5)	4.3 (0.7)	0.021
Factor 5: Structured style (4 items)	3.6 (0.7)	3.3 (0.9)	3.6 (0.7)	0.111
Social support				
Number of close friends ($n=31/29/1,202$), mean (SD)	4.4 (4.5)	7.8 (3.5)	8.6 (7.3)	0.005
Feeling lonely sometimes/often ($n=31/31/1,260$), %	74.2	54.8	51.6	0.043

SD: standard deviation. Numbers of respondents (n) are given for each variable. RSA: Resilience Scale for Adults. *Some to considerable degree.

polio group. Sixty-nine percent of the non-Western immigrant group exercised rarely or never, compared with 50% of the 2 other groups (Table IV).

The 2 immigrant polio groups reported a higher degree of unsatisfactory psychological well-being than the Norwegian polio group, while the same proportion in the 2 immigrant polio groups reported psychological problems requiring medical help or supervision (Table V). Non-Western immigrant men reported psychological problems significantly more often than women (44% vs 25%).

Resilience scores were similar in the immigrant and native groups, except for social resources, where the non-Western immigrant group had a lower score. The non-Western polio group had half as many good friends as the Western immigrant group and the Norwegian polio group (4 vs 9), and 74% of the non-Western group reported feeling lonely (Table V).

The non-Western immigrant group reported a similar number of concomitant diseases as the Norwegian polio group (1.6 vs 2.0), although they were much younger. There were sex differences regarding most diseases, especially for non-polio musculoskeletal disorders (data not shown). In the non-Western polio group, twice as many women as men reported osteoporosis (39% vs 22%), while heart disease was reported more frequently among men than women (11% vs none).

DISCUSSION

This study shows several differences between non-Western immigrants with polio to Norway and a native Norwegian polio group, in addition to differences between non-Western and Western immigrants with polio. In general, the non-Western immigrant group reported more severe problems than the Western immigrant and the native Norwegian polio groups. The Western immigrant and the native Norwegian polio groups were similar regarding most demographic and physical health-related characteristics. However, both immigrant groups were less satisfied with their mental health than were the native Norwegian polio group.

The mean age of the non-Western polio group was 25 years younger than the Western immigrant and the native Norwegian groups, and some of the findings can probably be explained by this age difference. The non-Western immigrant group also had earlier onset of acute polio, 3 vs 6 years as mean age of onset. This is in accordance with a Swedish study (11), and possibly reflects that continuous exposure to poliovirus in developing countries with endemic polio results in a lower age of contracting polio. Similarly, in Western countries the age of acute polio increased as polio developed from being endemic to epidemic (10). Hospitalization in the acute phase was less common in the non-Western polio group, as only one-third had been hospitalized, in contrast to two-thirds of the Western immigrant and native Norwegian groups. In addition, one-third of the non-Western group did not know if they had been hospitalized in the acute phase. This probably reflects a suboptimal healthcare system in many developing countries at the time, which was less well developed than in Norway 2 generations previously.

The non-Western polio group reported new muscular weakness, loss of muscle size and volume and post-polio syndrome 10–20 years earlier after the acute onset compared with the Western immigrant and the Norwegian polio groups, and at a mean age of 31 years. We do not know whether this earlier debut is due to younger age when contracting polio or to increased attention in recent years regarding the late effects of polio. The mean age for onset of new atrophy and paresis in native Norwegian polio patients is approximately 50 years (15).

Compared with the general non-Western immigrant population to Norway at the same age, osteoporosis, osteoarthritis, arthritis, lung disease and diabetes were reported more frequently in the polio groups. In

contrast, cancer and cardiac disease showed no higher numbers in the non-Western polio group, compared with the general immigrant population (data not shown) (20). Both the non-Western and the Western immigrant group reported unsatisfactory physical health to a higher degree than the native Norwegian polio group (Table IV), but all polio groups were 4 times more dissatisfied with their physical health than the general population of Norway (19).

There are no reliable biomarkers for post-polio development, including neurophysiology. Patient-reported new muscular weakness can also reflect pain, neuropathy, depression and deconditioning. The non-Western immigrant group had normal body weight, with a mean BMI of 25 kg/m^2, although nearly 70% claimed that they seldom or never exercised. Immigrant men and women, in general, exercise less frequently than the general Norwegian population, and they report having poorer health, especially in women and those aged 40–54 years (19, 20).

A study from Denmark showed that infectious diseases, mental disorders, diseases of the nervous system and diseases of the circulatory and respiratory systems were more common among polio survivors (25). Similarly, a study from Taiwan showed that polio patients have a higher risk of hypertension, ischaemic heart disease, stroke, rheumatoid arthritis and chronic pulmonary diseases (26). The current study supports these findings, except for heart disease.

The non-Western immigrant group reported severe fatigue, with a mean FSS score of 5.5. This is in line with a mean score of 5.7 in a study of a Norwegian polio group in 1997, the time of debut of post-polio in many polio survivors (27). The Western immigrant group and the native Norwegian polio group reported only moderate fatigue, in accordance with normative Norwegian data for the general population above 60 years (23). The high score among the non-Western immigrant group indicates that they are in the midst of a period of demanding daily life conditions, with possible post-polio syndrome, resulting in more fatigue. Fatigue tends to be more severe among younger polio patients, who also have more pain and lower quality of life (28).

The non-Western polio group reported more intense pain than the 2 other groups according to the visual analogue scale (VAS). Chronic pain and depression are reported differently across ethnic and socio-economic groups (29, 30). These findings might reflect an underlying psychological cause, or also lack of competence in the healthcare system to meet and treat persons with a different cultural background.

Psychological problems and loneliness were reported more frequently in the 2 immigrant polio groups. These findings are in accordance with the general population of non-Western immigrants to Norway, where more than one-third reported anxiety and depression, most frequently among women (20). In contrast, males in our non-Western polio group reported more psychological problems than females. Several of the problems in the immigrant polio groups probably attribute to feeling marginalized as an immigrant, rather than to being disabled.

The non-Western immigrant polio group had a higher level of education than the Western immigrant and the native Norwegian polio groups, with nearly half being educated at bachelor or higher university level. However, only one-third of the non-Western immigrant polio group was working full-time or part-time, and more than 40% received disability pension. This probably reflects difficulties in entering the labour market when both immigrant and disabled, and may also explain why the median income in the non-Western immigrant polio group was much lower than in the Western immigrant and native Norwegian polio groups.

Polio survivors who are active and employed have better quality of life, feel less lonely, and have better mental health than those who are not employed (13, 32, 33). A study of Norwegian polio patients in 2001 showed that 65% were employed until 60 years of age, and there was no significant association between severity of weakness and education, employment and profession (34). Annual income did not differ between polio patients and controls (35). A study from Denmark showed that Western polio patients had a higher risk of receiving disability pension, even if they were well educated, whereas their income was similar to cohort controls (36). Emphasis should be on enabling immigrants with polio to gain employment.

In the non-Western immigrant group, 72% reported using a powered wheelchair, and one in four were full-time wheelchair users. This contradicts previous findings that use of technical aids was especially problematic for immigrant men with polio, since they were visible signs of disability and thereby symbolized a lack of ability to take care of and protect the family (12). Earlier onset of polio, combined with lack of rehabilitation, orthopaedic devices, corrective surgery and orthopaedic equipment, would consequently lead to more severe deformities of joints, contractures and discrepancies in leg length, and thereby prevent functional gait. More than 80% of the non-Western group reported weakness of the lower limbs in the acute phase, and the residual chronic leg weakness was twice as high as in the Western and the Norwegian groups, indicating a more severe polio sequelae. This explains the increased use of wheelchairs.

The non-Western immigrant polio group reported that the public health system did not cover their needs. A possible explanation might be that lack of care in the

acute and early rehabilitation phase could lead to increased need for assistance and healthcare later in life. Increased independence was a main aim for the early rehabilitation of the native Norwegian polio group. This probably influenced the answers from this group.

Study limitations

The current study was based on a sample of only 66 polio-injured persons from a wide range of countries. Questions were based on a postal questionnaire and self-report only, and were not adapted to immigrants. Questionnaire-based studies might be susceptible to under-reporting due to social desirability effects. However, the survey was anonymous, reducing this risk. Comprehension of written Norwegian was required to answer the detailed questionnaire; therefore, the study population was probably biased toward highly educated immigrants, excluding immigrants with the most challenging social and economic situation. It is not known if some participats had help completing the questionnaire. However, the non-Western immigrant group reported a much higher level of medical, psychological and social challenges than the Western immigrant and native Norwegian polio groups, illustrating the need for special attention for the non-Western immigrant group.

The mean age of the non-Western polio group was 25 years younger than the Western immigrant and native Norwegian groups, and some of the findings were probably affected by the age difference. There are some reservations regarding our conclusions, due to both the age difference and the small sample size. However, in a study of a general immigrant population, it was shown that the health differences between immigrants and the total population could not be explained by the immigrants being younger (20). We therefore consider it justified to compare our 2 groups without adjusting for age. An advantage of the current study is that the immigrant results were compared with those for a large group of Norwegian polio survivors. We therefore believe that our cautious conclusions are justified.

Conclusion

The group of non-Western immigrants to Norway with polio studied here reported more health and social problems than did the native Norwegian polio group and the Western immigrant polio group, even though they were younger and more highly educated. Their complex psychological and social situation is relevant and requires active intervention from the public health system. Health professionals need extra skills to handle the complex situation of this group of patients.

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