

THE PREVALENCE OF LICHEN RUBER PLANUS IN DIFFERENT GEOGRAPHICAL AREAS IN SWEDEN

Lars Hellgren

From the Department of Dermatology, Sahlgrenska Hospital, Gothenburg, Sweden

Abstract. In the general population of 39,418 persons, within areas in the counties of Norrbotten (BD), Jämtland (Z), Skaraborg (R), Kristianstad west coast (LV) and Kristianstad east coast (L) in Sweden all inhabitants over the age of seven (Norrbotten over the age of 14) were investigated for the total number of cases of lichen ruber planus (l.r.p.). Re-investigations of non-response (10%–20%) were made in Norrbotten and Kristianstad, 1,142 persons. 165 children under the age of seven, purposively selected in Norrbotten, were investigated as also were some specialized populations, i.e. 1,298 steelworkers, 99 prisoners, 153 construction workers, 825 males, aged 18, on enlistment, 721 males in the defence forces refresher training course. The southernmost and northernmost areas were about 1,500 km apart and the distances between the different areas were usually 150–650 km. Every person was examined naked or seminaked. Computer was used in the mathematical calculations. The percentages and the *indices* for comparisons showed the order from the lowest to the highest prevalence in the counties to be: R (0.13%), L (0.21%), LV (0.27%), BD (0.34%), Z (0.30%). In the indices errors due to differences in ages or occupations between the areas were eliminated. The sex prevalence of l.r.p. was 0.3% males and 0.1% females. In the densely and thinly populated areas no significant differences in lichen ruber planus prevalence were found. Age pattern showed about the following order from the highest to the lowest prevalence of l.r.p. in age groups: 25–29 years, 75–79, 40–44, 50–54, 65–69, 35–39, 70–74, 45–49, 60–64, 20–24, 55–59, 30–34, and 15–19 years.

The prevalence of l.r.p. was determined in sex, age and occupational groups in total populations (39,418 persons) in Sweden. The morbidity in these groups was compared in different geographical and climatological areas, both densely and thinly populated. In the comparisons disturbing influence of irrelevant background factors was eliminated.

MATERIAL AND METHODS

A detailed account of the medical aspects of this study has been given elsewhere (1, 16).

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Populations investigated: A. Total general populations over the age of seven were examined as to the prevalence of l.r.p. in the following five major regions in the counties of: (a) Norrbotten (BD): 8,897 persons (3,916 males and 4,981 females). (b) Jämtland (Z): 3,302 persons (1,662 males and 1,640 females). (c) Skaraborg (R): 10,465 persons (5,258 males and 5,207 females). (d) Kristianstad, west coast (LV): 7,382 persons (3,613 males and 3,769 females). (e) Kristianstad, east coast (L): 5,287 persons (2,571 males and 2,716 females).

B. *Special populations* included: (a) Steel-workers in a steel works in Norrbotten: 1,298 males. (b) Prisoners in the Open Borstal Institution of Ulriksfors, Jämtland: 99 males. (c) Males undergoing medical examination on enlistment in the enrolment area of Io 3 (parts of the counties of Örebro and Västmanland): 825 males. (d) Males in the defence forces refresher training (Revinge and Hässleholm, Kristianstad west): 721 males. (e) Re-investigation in Norrbotten and Kristianstad: 1,142 persons (482 males and 660 females).

The distance between the northernmost and southernmost areas is about 1,500 km.

Statistical techniques

Sampling methods. Total sampling technique was used for the primary investigation of the populations over the age of seven, systematic random sampling for the groups (10–20%) not responding to the call for the primary investigation Be and for the group defined in Bc above.

Calculations. When comparing the prevalence of diseases between different geographical regions, the disturbing influence of differences in age groups and occupations in the areas must be eliminated. The "standard population method" (21) was used to calculate standardized index numbers which constitute directly comparable units.

Diagnostic criteria: L.r.p. consists of flat-topped, umbilicated, angular, violet or pink papules, rarely vesicles or bullae. Peculiar sheen in oblique light. Surface has network of fine, white lines under magnifying lens. Oral and genital mucous membranes show white lines of small white papules; nails show dystrophias and onychorrhexis. In scalp often alopecia. Isomorphic reactions are typical.

Criteria: Skin lesions that agree well with the macro-morphological definitions of lichen ruber planus and have

Table I. The prevalence of lichen ruber planus in randomly selected and investigated persons among the non-response group and among randomly matched persons from the primary survey

Area	Total no. in-vestigated	Patients in	
		Non-response with l.r.p.	Primary investigation with l.r.p.
Norrbottn	353	1	0
Kristianstad, west and east coast	789	1	2

one or more of the following characteristics: A typical histological picture, typical mucous lesions and/or nail changes, and an onset and development and symptoms typical for l.r.p.

Investigation routine: All the people who were to be examined within a given area had to pass seminaked through an examination room. The whole skin area (except the genital and anal regions and the feet) was examined. For a detailed description of the technique used in the survey, see special reports (1, 16, 17, 18).

Non-response: Non-response generally varied between 10–15%. By random systematic sampling among the non-response group in Norrbotten and Kristianstad, every sixth and every fourth person respectively was investigated. Those in the non-response group being investigated were individually matched with persons of the same sex, age and occupation and from the same geographical area but who had been investigated in the primary survey. The prevalences of l.r.p. in the two groups were then compared (Table I). The prevalences of l.r.p. in the two groups did not differ significantly (chi-square test). It is probable that this also applies to Jämtland and Skaraborg, where the non-response groups were not investigated. The non-response will thus hardly influence the morbidity figures in l.r.p.

Reliability. Diagnostic reliability: A few skin biopsies were made to confirm the diagnosis in doubtful cases. *Comparisons* had a high reliability as the same doctor performed all the examinations in all geographical areas and the disease therefore was diagnosed in the same manner. In the comparisons irrelevant background factors (age, occupational distribution, etc.) was eliminated by aid of the standard population method by which comparable indices were calculated. *Seasonal variations* might influence the comparisons in different geographical areas. The seasonal variations on the onset of l.r.p. were registered during a period 1954–1963 at the Department of Dermatology, Gothenburg, Sweden. No seasonal variations were, however, observed (19). This was in accordance with two other series where no seasonal variations in the onset of lichen ruber planus were found (25, 38). In another series an aggravation of l.r.p. was observed during summer (24). The present investigations were performed as far as possible at comparable times.

Time schedules: Primary investigations alternatively in the northernmost and southernmost areas: Skaraborg: January to May 1961. Jämtland: May to June 1961. Norrbotten: January to May 1962. Kristianstad, west and east coast: May to June 1962. Re-investigations in Norrbotten: April 1963; in Kristianstad: May 1963.

RESULTS

A. Comparisons of Regions

(a) Lichen ruber planus prevalence in different geographical areas

The prevalence of l.r.p. in different geographical areas and in densely and thinly populated areas was determined and the morbidity in similar groups compared.

Present series: The prevalence of l.r.p. was shown to be highest in Jämtland, then in order: Norrbotten, Kristianstad west, Kristianstad east, and Skaraborg (Tables I and II). By comparing different areas, differences in age or occupational structure of the population might influence the results. These irrelevant background factors were eliminated by using standardized indices (21). Apart from the percentage figures, therefore, index numbers for comparisons between the areas are also given. The prevalence figures and the standardized indices are in good accordance, i.e. there is no serious disturbing affect from differences in the age or occupational distribution between the areas.

Literature. Prevalence: The rate of l.r.p. in the general population in Faroe Islands was: 0.13% (29).

Table II. Percentage of lichen ruber planus in populations in the counties Norrbotten, Jämtland, Skaraborg and Kristianstad (west and east coast)

Standardized indices, where disturbing influence by differences in (a) age distribution and (b) occupational distribution between areas have been eliminated. The index values are calculated as to be used for vertical comparisons only in the table

Area	No. investigated	No. of persons with l.r.p.	%	(a) Stand. index	(b) Stand. index
Norrbottn	10,506	36	0.34	137.51	136.93
Jämtland	3,333	10	0.30	140.01	192.75
Skaraborg	11,197	14	0.13	52.39	50.62
Kristianstad,					
west	7,798	21	0.27	112.94	113.40
east	5,836	12	0.21	89.05	98.42

Table III. Percentage of lichen ruber planus (males and females) investigated in the counties of Norrbotten, Jämtland, Skaraborg and Kristianstad (west and east coast)

Standardized indices, where disturbing influences by differences in age and occupational distribution between the areas have been eliminated. The index values are calculated for vertical comparisons only

Area	Males				Females			
	No. lichen ruber planus	%	Stand. index Age elimin.	Stand. index. Occupation eliminated	No. lichen ruber planus	%	Stand. index. Age elimin.	Stand. index. Occupation eliminated
Norrbotten	24	0.45	135.69	134.77	12	0.23	148.17	147.26
Jämtland	8	0.47	149.28	223.50	2	0.12	103.99	106.89
Skaraborg	12	0.20	62.70	61.03	2	0.04	25.46	23.44
Kristianstad, west coast	14	0.37	114.61	116.42	7	0.17	118.12	107.21
Kristianstad, east coast	7	0.24	75.50	89.42	5	0.18	122.09	131.85

Incidences: Europe: Sweden: 0.55% among patients with skin diseases, Dept. of Dermatology, Gothenburg, in 1954–1963 (19). 0.8% among 40,450 first attendance patients at Karolinska sjukhuset, Stockholm (22). In another series, Stockholm: 0.2%–1.3% (15). *Denmark:* 0.8% and 1.0% among patients hospitalized at dermatological clinics, Copenhagen (29). Among 20,169 first attendance patients, Finsen Institute, 1947/1948, 0.9% (36). *Norway:* Frequency low (4). *England:* Central London 1.0% (1905), 1.3% (1951), 1.4% (1961) (30). London 0.71% (6). 1.2% in St John's Hospital for Diseases of the Skin (35). 1.47%, London (40). *Germany:* Among 15,000 patients 0.52% to 0.72% during the years 1952–1956 (13). 0.44% (26), 0.37% in Berlin (25). *Russia:* 0.44% (40). *France:* Frequency of lichen ruber acuminatus is "rather high" (40). Toulouse 0.16% (40). *Austria:* Lichen ruber acuminatus "not uncommon" (40). *Italy:* 1.2%, Dept. of Dermatology, University of Turin (9). *Poland:* 0.57%, Wroclaw (40).

North America: U.S.A.: 0.3% (negroes) 1919–1935 (30). 0.45% (40).

Africa: Algeria: 1.4% (30). *Egypt:* 0% (30). *Ethiopia:* 0.79% (30), *Senegal:* negroes 0%; whites 0% (30). *Nigeria:* 1.1% 1950, 1.0% 1960, and in 10 years in the average 1.1% (30). *Angola:* negroes and mulattoes 0%; whites 0% (30). *Mozambique:* negroes and mulattoes 0%; whites 0% (30). *Cape Province:* 1.2% (whites) in 1,000 dermatological skin patients private practice (30). 0.6% whites, hospitalized (30). 1.0% among coloured patients in hospital (30). "Prac-

tically unknown in negroes" (39), 0.9% Bantu negroes (30).

South America: Brazil: 0% (30).

Asia: Batavia: 0%. *India:* 0.8% among hospitalized, 2.0% in private practice. *Lebanon:* 0%. *Israel:* Among 1,759 patients seen in 1959 31 cases (1.8%) of l.r.p. were recorded, 24 (1.4%) with the actinic type, Tel Aviv (24). *Jerusalem:* 0.95%, Skin Department of Kaput Wolin 1948–1957 (10). Out of 40 patients with actinic lichen planus 83% were of Oriental origin (Iraq, Egypt, North Africa, Afghanistan, Yemen, India, Turkey, Bukara) (24).

Australia: 0% (30).

South Pacific: New Guinea: 0% (40).

(b) Densely and thinly populated areas

It has been claimed that l.r.p. is more prevalent in centres of high culture (37) and also that the disease is more prevalent among rich than among poor people (27). Differences in dietics are considered to be an important factor (34).

Present series: The prevalence of l.r.p. among inhabitants living in densely populated areas (more than 200 persons/square km) was compared with that of inhabitants randomly matched according to sex, age, occupation and from the same area but living in thinly populated areas (less than 200 persons/square km) (11). Differences in the ratio of lichen ruber in the two groups were then tested in: *Skaraborg:* Of 1,287 persons living in a densely populated area, 3 had l.r.p. (0.23%) and of 1,287 "matched persons" living in a thinly populated area 2 had l.r.p.

Table IV. Prevalence of lichen ruber planus in five-year age groups in populations in the counties of Norrbotten, Jämtland, Skaraborg and Kristianstad (west and east coast)

Standardized indices, where disturbing influence from differences in occupational distribution between the areas have been eliminated. Indices comparable "horizontally" only

Age group	Norrbotten			Jämtland			Skaraborg			Kristianstad, east			Kristianstad, west		
	Index	%	No l.r.p.	Index	%	No l.r.p.	Index	%	No l.r.p.	Index	%	No l.r.p.	Index	%	No l.r.p.
<i>Males</i>															
15-19	0.00	0.00	0	0.00	0.00	0	161.43	0.08	1	0.00	0.00	0	0.00	0.00	0
20-24	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	828.33	0.53	1
25-29	55.23	0.40	2	412.78	1.08	1	120.78	0.62	2	0.00	0.00	0	183.74	0.92	2
30-34	124.39	0.55	3	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	169.43	0.84	2
35-39	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	106.14	0.36	1	197.06	0.40	1
40-44	26.64	0.18	1	343.94	0.78	1	123.83	0.69	3	93.94	0.30	1	175.67	0.88	3
45-49	107.50	0.76	4	0.00	0.00	0	57.98	0.22	1	141.96	0.44	1	199.68	0.55	2
50-54	224.72	0.87	4	101.07	0.85	1	33.94	0.21	1	95.45	0.46	1	47.09	0.34	1
55-59	161.85	1.17	4	0.00	0.00	0	98.91	0.70	3	215.17	1.24	2	0.00	0.00	0
60-64	212.06	1.23	3	138.52	1.35	1	0.00	0.00	0	82.52	0.68	1	91.26	0.78	2
65-69	43.89	0.50	1	607.08	4.29	3	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
70-74	736.59	0.81	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
75-79	291.67	1.37	1	388.89	2.63	1	110.06	0.87	1	0.00	0.00	0	0.00	0.00	0
<i>Females</i>															
20-24	166.13	0.21	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
25-29	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	791.78	0.56	1	0.00	0.00	0
30-34	268.54	0.21	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
35-39	138.61	0.22	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	208.73	0.33	1
40-44	187.22	0.19	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	222.81	0.31	1
45-49	82.30	0.22	1	0.00	0.00	0	0.00	0.00	0	203.71	1.02	2	161.60	0.58	2
50-54	0.00	0.00	0	730.66	1.83	2	78.62	0.22	1	183.33	0.45	1	0.00	0.00	0
55-59	205.42	1.05	4	0.00	0.00	0	40.34	0.26	1	76.28	0.47	1	103.48	0.64	2
60-64	381.22	0.29	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
65-69	421.43	0.41	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
70-74	171.43	0.54	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
75-79	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	381.69	1.05	1

(0.16%). There was no significant difference. *Jämtland*: Among 56 randomly selected persons living in a densely populated area and 56 randomly selected "matched persons" living in a thinly populated area none had l.r.p.

B. Category Comparisons

(a) Sex distribution

Present series: Sex prevalence of lichen ruber planus among total populations, 39,571 persons, 20,569 males and 19,002 females, was 0.3% males and 0.1% females (Table III). In all the areas the prevalence of l.r.p. was higher among males than among females. As comparisons between the different geographical areas might be affected by differences of age among males and females in the areas or by differences in the occupational pattern it was necessary to eliminate the affect of such differences in the comparisons

by calculation of standardized indices. Standardized indices agreed well with the percentage figures. The prevalence of l.r.p. was highest among males in Jämtland and then in order: Norrbotten, Kristianstad west, Kristianstad east, and Skaraborg. For females the order was: Norrbotten, Kristianstad east, Kristianstad west, Jämtland and Skaraborg.

Literature: Incidences: Europe: Sweden 0.6% males, 0.5% females, Dept. of Dermatology, Gothenburg, 1954-1963 (19). 0.9% males, 0.7% females, Stockholm, 1959 (22) female/male ratio 1.7 (2). *Denmark*: 0.9% males, 0.9% females, 1957-1958 (36). *England*: 63% males (28). 60% females (44). 61% females, 39% males (43). "More frequent in females" (39). *Germany*: 57% females, 43% males (3). "A majority of women", 1952-1956 (13). 2/3 males (23). 59.1% males, 40.9% females (33). 2/3 males (27). Males more

often than females (20). Males/females, ratio 2 : 1 (31). Males/females, ratio 2 : 1 (32). 45% males, 55% females (12). "More frequent among adult males than adult females" (8). In Berlin, 1914–1931, frequency among males 22% higher than among females (42). *France*: "Males more often than females" (5). *Italy*: 54% males, 46% females (9).

Africa: Males/females 3 : 2 (38).

North America: U.S.A.: Males/females 1 : 2 (41).

(b) Age prevalence

Present series: The prevalence of l.r.p. in five-year age groups, males, females and both sexes, is shown in Tables IV and V and Fig. 1. As differences in occupational patterns in the different areas might affect the morbidity figures, standardized indices were calculated for comparisons. The index values are calculated so as to be used for horizontal comparisons primarily in the tables.

Arithmetical means and median for the prevalence for lichen ruber planus

Arithmetical mean: *Norrbotten*: males 52.4 ± 12.1 years, females 52.9 ± 11.7 years. *Jämtland*: males 57.4 ± 16.1 years, females 52.6 years. *Skaraborg*: males 49.9 ± 13.5 years, females 54.0 years. *Kristianstad, west coast*: males 39.5 ± 14.5 years, females 53.0 ± 14.0 years. *Kristianstad, east coast*: males 52.4 ± 8.1 years, females 45.8 ± 11.7 years.

Median: *Norrbotten*: males 54 years, females 55 years. *Jämtland*: males 64 years, females 52 years. *Skaraborg*: males 49 years, females 54 years. *Kristianstad, west coast*: males 40 years, females 53 years. *Kristianstad, east coast*: males 54 years, females 49 years.

Literature: Population studies on prevalence of l.r.p. age groups in total populations have never been performed.

Incidences: *Europe*: *Sweden*: Most cases occurred in the age groups 30–60 years, males and females, in 365 patients, Dept. of Dermatology, Gothenburg, 1954–1963 (19). Most frequent in the age group 25–50 years (15). *Denmark*: Predominance in the age groups 30–60 years for males and with a maximum in the age group 30–39 years. Females most frequent in the age group 50–59 years (36). *Germany*: The ages of onset ranged from 10–70 years, 85% onsets be-

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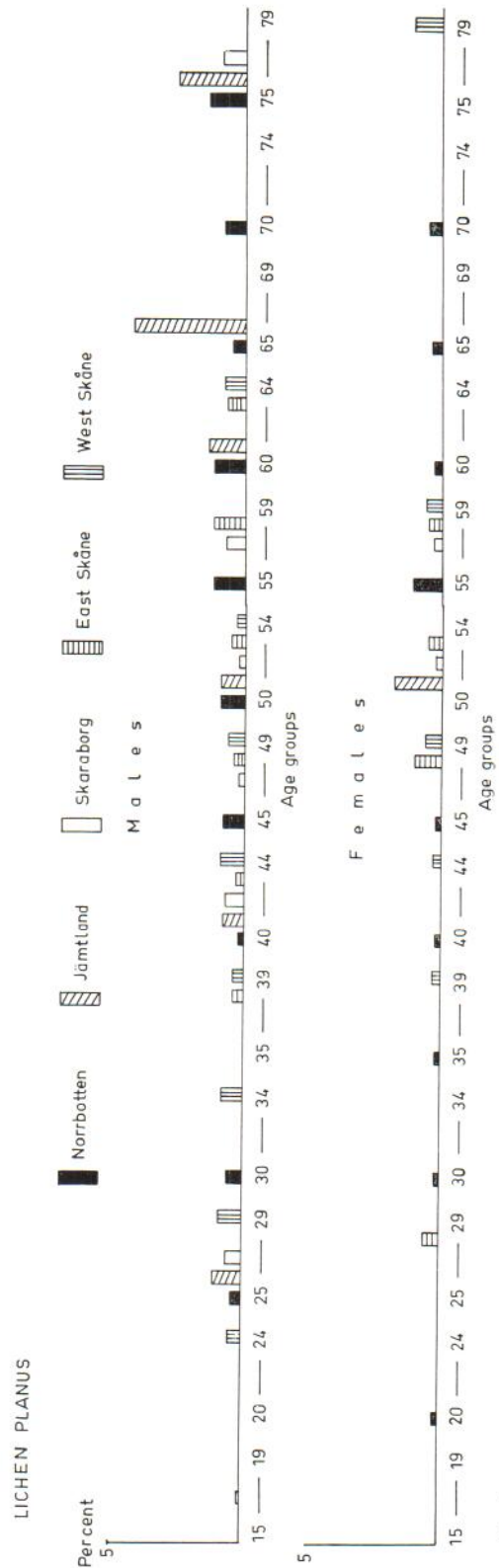


Fig. 1

Table V. Prevalence of lichen ruber planus in five-year age groups (males and females) in five geographical areas

Age groups	Norrbotten			Jämtland			Skaraborg			Kristianstad (east coast)			Kristianstad (west coast)			Total	
	Index	%	l.r.p.	Index	%	l.r.p.	Index	%	l.r.p.	Index	%	l.r.p.	Index	%	l.r.p.	Index	%
15-19	0.00	0.00	0	0.00	0.00	0	235.89	0.06	1	0.00	0.00	0	0.00	0.00	0	47.18	0.01
20-24	86.99	0.11	1	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	413.49	0.25	1	100.10	0.07
25-29	49.04	0.22	2	350.62	0.56	1	104.21	0.30	2	98.97	0.27	1	161.32	0.47	2	152.83	0.36
30-34	146.01	0.40	4	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	138.58	0.41	2	56.92	0.16
35-39	67.45	0.10	1	0.00	0.00	0	0.00	0.00	0	245.56	0.20	1	202.28	0.36	2	103.06	0.13
40-44	55.67	0.18	2	292.49	0.41	1	102.25	0.34	3	91.19	0.18	1	185.71	0.60	4	145.46	0.34
45-49	97.31	0.51	5	0.00	0.00	0	36.11	0.11	1	189.91	0.71	3	189.22	0.56	4	102.51	0.38
50-54	148.98	0.43	4	308.07	1.32	3	50.38	0.22	2	106.41	0.46	2	30.90	0.16	1	128.95	0.51
55-59	177.47	1.11	8	0.00	0.00	0	73.78	0.49	4	149.48	0.81	3	48.70	0.33	2	89.89	0.55
60-64	223.14	0.68	4	124.57	0.69	1	0.00	0.00	0	75.26	0.33	1	79.40	0.39	2	100.47	0.42
65-69	120.49	0.45	2	486.21	2.08	3	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	121.34	0.51
70-74	514.78	0.65	2	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	102.96	0.13
75-79	221.43	0.58	1	329.17	1.41	1	83.04	0.42	1	0.00	0.00	0	95.42	0.53	1	145.81	0.59

tween 30-70 years (3). Maximum among males, 30-60 years (13). Most frequent in the fourth and sixth decades (42). Rare in children and in old age, maximum in the middle age (42). Usually seen in the age group 20-40 years (32), most frequent in the age group 20-25 years (27), most frequent in the age group 20-40 years (23), or age group 30-50 years (20), maximum in the age group 20-25 years (12). L.r.p. was described in a child 5 months old (14) and in a child 8 months old (23). The highest frequency in the age group 31-60 years both sexes, males 41-50 years, females 51-60 years. 12.5% of the patients were found in age groups over 60 years. The prevalence of l.r.p. in the age groups were: 0-10 years, males 0.00149%, females 0.0018%; 11-20 years, males 0.0043%, females 0.0043% (25). *France*: Most frequent after maturity, seldom among children and old people (5). L.r.p. was reported in a child 4 months old (5). *England*: Most frequent after the second decade and is rare in children and old people (7, 35, 44).

North America: U.S.A.: An increase in l.r.p. frequency during childhood (41).

Asia: Israel: Two children under the age of 9, 12 under the age of 19 were seen in one series. Maximum incidence in the third decade (38).

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Lars Hellgren, M.D.
 Department of Dermatology
 Sahlgrenska Hospital
 S-413 45 Gothenburg
 Sweden