

Trends in Specific Morbidity Prevalence in Male Adolescents in Israel over a 50 Year period and the Impact of Recent Immigration

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Abstract

Background: Most Israeli males aged 16–17 undergo a thorough medical examination prior to recruitment into the army. During the last 50 years, extensive data have been gathered enabling a study of time trends in the prevalence of common diseases in this age group.

Objectives: To examine the current prevalence of common diseases, compare the results with those of previous cohorts, and assess the influence of the massive immigration during the 1990s.

Methods: The health examination at the recruitment centers includes a medical history, complete physical examination, and review of medical documentation provided by the family physician. If needed, additional tests and referral to specialists are ordered. The prevalence of selected diseases and severity was drawn from the computerized database of the classification board. Two cohorts, 1992–94 and 2003–04, were examined and compared with three previous cohort studies in 1957–61, 1977–78 and 1982–84. Data were stratified according to origin and country of birth.

Results: The prevalence of asthma increased dramatically during the years from 10.2 per 1000 examinees in 1957–61 to 111.6 per 1000 examinees in 2003–04. The prevalence of tuberculosis declined and then increased from 0.6 per 1000 adolescents in 1982–84 to 2.4 per 1000 adolescents in 2003–04. The prevalence of type 1 diabetes mellitus increased from 0.2 cases per 1000 examinees in 1957–61 to 0.8 cases in 1977–78 and 1982–84 and 0.9 cases per 1000 examinees in 2003–04. The prevalence of severe heart defects and severe epilepsy declined in the last 20 years (1.4 and 1.7 cases per 1000 examinees in the 1982–84 cohort to 0.4 and 0.3 cases per 1000 examinees in the 2003–4 cohort respectively). The patterns of disease prevalence were different for immigrants: tuberculosis was more common while asthma and allergic rhinitis were less prevalent.

Conclusions: The prevalence of common diseases among adolescents in Israel has changed over the last 50 years. There is a different pattern for immigrants and for those born in Israel.

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drafted in 1957–61 and 1977–78 [1]. They concluded that the prevalence of asthma and diabetes mellitus type 1 had increased and that the prevalence of tuberculosis had decreased.

In the last 20 years a major demographic change occurred in Israel due to massive immigration from Ethiopia and the former Soviet Union [2]. Also important is the significant progress in diagnostic technology during this period. For example, 20 years ago an echocardiogram was not part of the routine examination for heart murmurs and diagnoses were largely based on physical examination. Today most cardiac diagnoses are made by echocardiogram, which may cause a bias in the reported prevalence of heart defects. The aims of the present study were to examine trends in the prevalence of common diseases in Israel in the last 50 years and to examine whether ethnicity and immigration influenced the prevalence of these diseases.

Subjects and Methods

The National Military Service Act requires all 17 year old Israelis to present themselves at local recruitment centers for the purpose of classification for military service. All Jewish, Druze and Circassian males are obliged to serve in the military and therefore undergo this physical examination. Arab citizens are exempt from service, as are ultra-Orthodox Jews. Most boys are examined (94% of those born in 1965–66 and 80% of those born in 1986–87). Girls who declare themselves to be Orthodox religious are exempted from service and are not examined. The study was performed in males because of the relative completeness of data.

The health examination includes a medical history uptake, detailed physical examination and urinalysis. Documentation of reported conditions is requested from the family physician. Additional tests and referral to specialists are performed if needed. Diagnosed conditions are categorized by diagnosis and severity according to a standard classification manual.

The study group included all males who were examined in the recruitment centers during 1992–94 and 2003–04. Comparisons were made with reports on three similar cohorts in 1957–61, 1977–78 and 1982–84. Previous studies showed that the prevalence of diseases varies according to ethnic origin. We examined the effect of origin on the prevalence of diseases by stratifying the 2003–04 cohort according to the origin of the examinees. The

In Israel, most adolescents are examined by a physician prior to their conscription into the army. This nationwide medical examination is a potential source for assessing the state of health of Israeli youth and for observing trends in the prevalence of selected diseases over the years. Twenty years ago, Kark et al. [1] published a study on the prevalence of selected diseases among 17 year old Israeli males examined in recruitment centers, and compared their findings to cohorts of adolescents who had been

information was collected from the computerized system of the Israel Defense Force. The sizes of the cohort populations are not presented for national security reasons. For statistical analysis, chi-square tests were used for categorical variables (prevalence of disease).

Results

The prevalence of selected diseases in the 1992–04 and 2003–04 cohorts as compared to three previous cohorts (1957–61, 1977–78 and 1982–84) are presented in Table 1. The prevalence of asthma has consistently increased during the last 50 years from 10.2 cases per 1000 males in the 1957 cohort to 111.6 per 1000 males in the current cohort. The prevalence of tuberculosis was 18.3 per 1000 males in the 1957 cohort; it decreased dramatically in the 1977–78 and 1982–84 cohorts to less than 1 per 1000 and increased to 2.4 per 1000 males in the current cohort. The prevalence of heart defects decreased between 1957 and 1977 but consistently increased from 1977 until the current cohort. The prevalence of severe heart defects and severe epilepsy dramatically decreased in the 1992–94 and 2003–04 cohorts [Table 1].

Table 1. Prevalence of selected diseases per 1000 male examinees aged 17–18 by induction cohorts in Israel between 1957 and 2004

	1957–61	1977–78	1982–84	1992–94	2003–04
Asthma	10.2	33.6	40.8	72.3	111.6
Severe asthma*	2.5	<0.1	0.1	<0.1	<0.1
Tuberculosis	18.3	0.9	0.6	1.1	2.4
Diabetes mellitus types 1+2	0.2	1.1	0.9	0.6	1.1
Diabetes mellitus type 1	0.2	0.8	0.8	0.5	0.9
Heart defects	10.1	6.6	9.5	10.5	16.2
Severe heart defects*	3.5	1.6	1.4	0.3	0.4
Epilepsy	3.2	5.5	4.3	4.3	7.8
Severe epilepsy*	2.8	1.3	1.7	0.2	0.3

* A severe disease is a disease that disqualifies the examinee from being drafted.

Table 2. Prevalence of diseases per 1000 males aged 17–18 years, in Israel, according to birth country in the 2003–04 cohort

	Soviet						P
	Israel	Western	Union	Asian	African	Ethiopian	
All examinees	775.4	53.9	152.7	3.6	0.9	13.5	
Asthma	119.3	103.9	83.9	95.9	27	27.8	< 0.0001
Severe asthma*	0.1	0	0.2	0	0	0	0.85
Allergic rhinitis	92.1	91.4	130.5	68.5	27	14.8	< 0.0001
Tuberculosis	0.4	1.9	8.3	2.1	0	50.0	< 0.0001
Diabetes mellitus types 1+2	1.2	0	0.8	0	0	0	0.54
Diabetes mellitus type 1	0.9	0	0.5	0	0	0	0.6
Heart defect	16.9	10.2	15.2	0	0	15.4	0.09
Severe heart defects*	0.5	0	0.2	0	0	0	0.73
Epilepsy	7.9	6.5	8.0	6.8	0	5.6	0.94
Severe epilepsy*	0.4	0.5	0.3	0	0	0	0.98

* A severe disease is a disease that disqualifies the examinee from being drafted

In order to examine the effect of recent immigration, we stratified the last cohort by country of birth of the draftees [Table 2]. The prevalence of asthma and allergic rhinitis was significantly lower among adolescents who were born in Ethiopia than in adolescents of other origins. On the other hand, the prevalence of tuberculosis was much higher in adolescents from Ethiopia and the former Soviet Union compared to other countries of birth (allergic rhinitis was evaluated only in the last cohort). There were no cases of diabetes mellitus among draftees born in Ethiopia. There was no significant change in the prevalence of heart defects and epilepsy between the different countries of birth.

Figure 1 shows the prevalence of asthma in cohorts from 1957 to 2004, which is rising consistently. Figure 2 shows the prevalence of tuberculosis in the 1992–94 and 2003–04 cohorts with stratification by native Israelis and immigrants. The prevalence of tuberculosis in native Israelis persistently decreased, and the overall increase in the prevalence of tuberculosis in Israel in the last 20 years is due to the immigration.

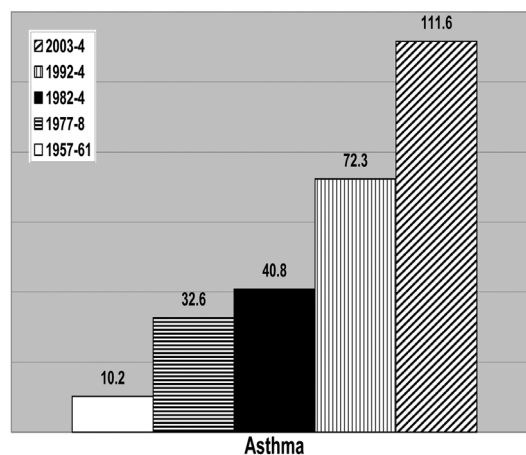


Figure 1. Prevalence of asthma among 1000 males aged 17–18 years, in Israel, by induction cohorts between 1957 and 2004

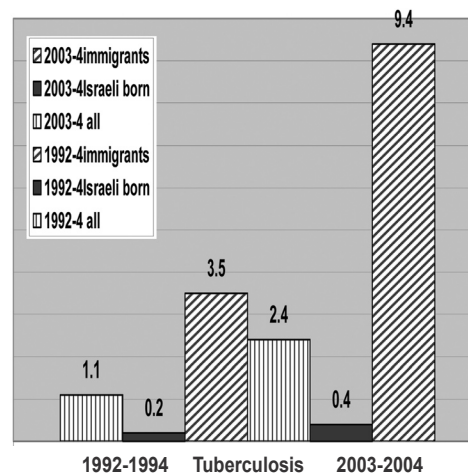


Figure 2. Prevalence of tuberculosis among 1000 male adolescents, in Israel, according to year and immigration status

Discussion

To the best of our knowledge Israel is unique in that the majority of the country's 17 year olds undergo a thorough medical examination, the purpose of which is medical screening prior to induction into the military. This event enables the examination of time trends in the prevalence of selected disease prevalence in Israel over the last 50 years. Furthermore, the dynamic nature of the Israeli population with its massive immigration waves permits the study of the effects of ethnic origin and immigration on disease prevalence. The aims of this study were to illustrate trends in the prevalence of selected diseases and to study the effect of origin and immigration on the prevalence of diseases.

The 1940–43 cohort was unique because most of the draftees were immigrants who arrived in Israel after the Second World War; in the other four cohorts most of the draftees were born in Israel although their parents were born in different countries, which possibly affected their lifestyle. The current cohort includes two large subgroups: the majority of adolescents were born and raised in Israel, but a significant number were born and partly raised in Ethiopia and the former Soviet Union. We also examined a cohort from 1992–94 in which the effect of the immigration wave was milder than in the current cohort. The presentation of a variety of morbid conditions provides a general view of the health status of Israeli adolescents in the last 50 years. We will discuss each disease separately.

Asthma

There was a consistent and significant increase in the prevalence of asthma in the last 50 years. Since the diagnostic criteria of asthma have not changed in the last 50 years, these findings indicate a genuine increase in the prevalence of asthma in Israel. This increase could be due to changes in lifestyle or environmental hazards in Israel. A similar trend was found in other studies of younger Israelis and in other countries [3-8]. Another possible explanation for this phenomenon can be found in the theory that inversely connects the prevalence of asthma and other atopic diseases to the incidence of infectious diseases. The T-helper cells are differentiated to type 2 rather than to type 1 and contribute to the development of atopic diseases [9].

In order to neutralize the effect of immigration we examined the prevalence of asthma in native Israelis excluding immigrants in the 1992–94 and 2003–04 cohorts [Figure 1]. We found that without the immigration the prevalence of asthma was even higher. The prevalence of asthma and allergic rhinitis in adolescents of Ethiopian origin was lower than in adolescents from other origins. These differences can be due to genetic reasons [6]. The difference according to origin and immigration suggests that both genetic and environmental etiologies are involved in the evolution of asthma.

Diabetes mellitus

We found a significant increase in the prevalence of diabetes mellitus type 1 from 1957–61 to 1982–84 and a mild increase between 1992–94 and 2003–04. The results are similar to those found in other studies in Israel and the United States [10,11].

Since the diagnostic criteria for diabetes mellitus in the IDF have not changed in the last 12 years, we believe that a genuine increase in the prevalence of diabetes mellitus type 1 has occurred in Israel. In comparison, by origin we found that the prevalence of diabetes mellitus type 1 and type 2 are higher in adolescents of western, Asian and Soviet Union origins than in adolescents of Israeli and Ethiopian origins. For each origin the prevalence of diabetes mellitus type 1 is lower in adolescents who were not born in Israel than in adolescents who were (data not shown). This difference cannot be explained by genetic changes and may be due to the dietary habits in Israel or from an environmental hazard not yet identified.

Tuberculosis

A significant increase in the prevalence of tuberculosis in adolescents occurred from 1982–84 to 2003–04, in contrast to the constant decline from the 1957–61 cohort to the 1982–84 cohort. In order to determine whether the increase in prevalence is due to immigration, we examined the prevalence of tuberculosis in the 1992–94 and 2003–04 cohorts in native Israelis and immigrants [Figure 2]. The prevalence among native Israeli adolescents has not increased since 1982–84. The increase in the prevalence of tuberculosis in Israel in the last 20 years is therefore the result of the immigration.

As expected, the prevalence of tuberculosis is dependent on origin, with higher rates among Ethiopian adolescents (3.7%) and adolescents from the former Soviet Union (0.66%) than in adolescents from western countries and Israel (0–0.03%). These results are similar to those of studies conducted in the USA [12].

Heart defects

There was an increase in the prevalence of heart defects in male adolescents between 1982–84, 1992–94 and 2003–04. However, during the same time there was a decrease in the prevalence of severe heart defects, which disqualify inductees from military service. This trend was also found in studies in other countries [13]. Origin and immigration status did not affect the prevalence of heart defects.

A possible explanation for our findings is the improvement in imaging techniques and the increased use of echocardiography. This enables the diagnosis of milder heart defects, such as mitral valve prolapse, mitral regurgitation and tricuspid regurgitation, that might previously have been overlooked. The decrease in the prevalence of severe heart defects could be due to the progress in pediatric cardiology and heart surgery over the last 20 years or from prenatal diagnosis. Today, some heart defects can be cured or treated to the extent of enabling a normal life.

Conclusions

Our study revealed trends in the prevalence of selected chronic diseases among 17 year old males in Israel over the last 50 years. In general, the prevalence of infectious diseases decreased while

IDF = Israel Defense Force

the prevalence of atopic diseases increased. Immigrants are affected, but their descendants who are born in Israel tend to have a health profile similar to that of the general population. This could be due to adopting an Israeli lifestyle and diet. Moreover, as Jews of various origins are intermarrying more and more, the genetic differences that probably influenced the different disease prevalence are suppressed and lifestyles and diets are becoming mixed. The recent immigration of adolescents from Ethiopia with their unique health characteristics will most likely also undergo the melting-pot process. It will be interesting to see the trends in their health status in the next generation.

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Capsule

Genes and inflammatory bowel diseases

Inflammatory bowel diseases (IBDs) such as Crohn's disease and ulcerative colitis are thought to be caused by an inappropriate immune response to commensal intestinal bacteria. There is strong evidence that these disorders have a genetic component; for example, individuals carrying specific sequence variants of the *NOD2/CARD15* gene are at increased risk. Now, in a genome-wide association study, Duerr and colleagues find that a rare sequence variant of

the gene encoding the receptor for interleukin-23 (IL23R) significantly lowers an individual's risk of developing IBDs. Interleukin-23 is a cytokine that has attracted increasing attention because of its role in a wide range of chronic inflammatory diseases in mouse models, including IBDs, multiple sclerosis and arthritis.

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Capsule

The genome of the sea urchin *Strongylocentrotus purpuratus*

In an article by Erica Sodergren et al. (more than 200 authors, from 78 institutions), the authors report the sequence and analysis of the 814-megabase genome of the sea urchin *Strongylocentrotus purpuratus*, a model for developmental and systems biology. The sequencing strategy combined whole-genome shotgun and bacterial artificial chromosome (BAC) sequences. This use of BAC clones, aided by a pooling strategy, overcame difficulties associated with high hetero-

zygosity of the genome. The genome encodes about 23,300 genes, including many previously thought to be vertebrate innovations or known only outside the deuterostomes. This echinoderm genome provides an evolutionary outgroup for the chordates and yields insights into the evolution of deuterostomes.

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