



The Western Galilee Experience: Reducing Infant Mortality in the Arab Population

Avshalom Strulov MD MPH

School of Public Health, Faculty of Social Welfare and Health Studies, Haifa University, Haifa, Israel
Ministry of Health, Kinneret Subdistrict, Northern District, Israel

Key words: infant mortality, rate reduction, Western Galilee Arab population, health education, congenital defects

Abstract

Until the end of the 1980s almost no intensive intervention plan was applied to narrow the vast gap (over 100%) in infant mortality between Jews and Arabs in the Western Galilee region of Israel. A special committee appointed by the Ministry of Health instituted measures to reduce the gap, including monitoring mortality rates by establishing an online and real-time computerized information system to analyze the information without delay. Based on the epidemiologic findings, an intervention program was implemented, using health education to reduce mortality due to seasonal infections – gastroenteritis in summer and upper respiratory and hyperthermia in winter. Within 1 year these infections had abated, resulting in significantly reduced mortality. The next step was the development of an ultrasound preventive campaign using sophisticated sonography to screen pregnant women in risk groups for lethal congenital defects and convincing them to discontinue the pregnancy. These two measures reduced infant mortality dramatically. The campaign has been widened to the entire northern district and is presently addressing, as a primary prevention, the traditionally difficult problem of consanguineous marriages – the major cause of congenital defects in the Arab population.

IMAJ 2005;7:483–486

Infant mortality remains one of the most important measures of a population's health [1]. It reflects most aspects related to health on the one hand and lifestyle on the other [2]. In terms of health-related measures, infant mortality is an indicator of the existence of preventive mother and child medical services, their accessibility and use, as well as the level of midwifery services in hospitals [3]. In terms of lifestyle measures, infant mortality mirrors the population's health behavior (health services, food and nutrition), socioeconomic level, perceptions, beliefs, and traditions regarding morbidity [4]. Infant mortality commonly serves as a measure for comparing the health situation of different countries and of different populations within countries. It is also frequently used for various public health needs [1], such as determining resource allocation, designing intervention plans, and for educational and academic purposes. Such comparisons are made by the health ministries in different countries, the World Health Organization, and various non-governmental organizations and associations [5].

Infant mortality in Israel has declined steadily and its incidence figures approach those of western countries. The general incidence figures measured in 1999, 2000 and 2001 were 5.6, 5.5 and 5.1 (per 1,000 live births) respectively. The 5.5 per 1,000 rate in 2002 indicates an increase as compared to the year 2001, bringing us back to the situation in 2000 [6]. This should sound the alarm for professionals and decisions makers. In the present article I describe our experience from the late 1980s and early 1990 in successfully reducing infant mortality rates.

An in-depth examination of specific rates in populations that constitute the general incidence rates reveals a gap in the incidence of infant mortality between the Jewish and the Arab population in Israel [6]. While mortality incidence figures in the Jewish population in 2000, 2001 and 2002 were 3.9, 3.9 and 4.0 respectively, in the Arab population they were 8.7, 7.8 and 9.0. This gap of 114% may be due to either of the aspects represented by the infant mortality measures of health and/or lifestyle.

Having been intensely involved in the past decade in reducing infant mortality in the Arab population, I believe that this gap between Jewish and Arab populations, which still exists, should be regarded as fundamental – i.e., resulting from lifestyle and world outlook. Yet these factors may be amended to narrow or even close the gap, albeit over a time span of many years.

The central premise of this article is that intervention plans drawn up in the late 1980s and throughout the 1990s specified maximization of the ability to reduce the gap in the short term. However, the necessary focus should be on aspects that will lead to their reduction in the long term. It should be mentioned at this point that although data pertinent to infant mortality – like birth weight, maternal age and maternal education – were available to the Ministry of Health committee at that time (a special committee appointed to address the issue), we do not have the relevant data due to the long time that has elapsed since then.

The plan and its implementation

In the late 1980s I was appointed by the Israel Ministry of Health as coordinator of a multi-professional and multi-organi-

zational committee, mandated to reduce, as much as possible, the gap in infant mortality between the Jewish and the Arab populations in the Western Galilee. The committee consisted of doctors, nurses, health educators, and an economist (for budget planning). Its members were from the Faculty of Medicine at the Technion (myself), the Regional Health Department in Acre, the Western Galilee area hospital in Nahariya, and the major health management organization in Israel (Clalit Health Services).

An examination of infant mortality between 1980 and 1984 showed that in the Jewish population its incidence per 1,000 live births was 11.8 per year on average, while among the Arab population for those years it was 22.6 [7]. This gap of 91% had not been previously examined in depth, and no earlier attempts had been made to reduce it.

As is customary for policy makers, within a few months the committee was questioned on its progress: what had been done to date and whether the gap had already begun to narrow. This approach by the politicians created a sense of urgency in the committee and the feeling that quick action had to be taken to achieve quick results. However, an attempt to obtain up-to-date data from the Central Bureau of Statistics revealed a delay of three years regarding information about the nature and causes of infant mortality. Naturally, this hampered our ability to devise any kind of intervention plan that relied on real-time events. The first step taken by the committee was to set up an on-line updating information system to facilitate examination of the distribution of deaths in real time, by ethnic origin, age, and cause of death. In parallel, the latest data on births were obtained from the Central Bureau of Statistics to establish a denominator and calculate the incidence figures.

Table 1 demonstrates the average annual infant mortality in the country and the relevant region, pointing to the large differences between the populations. Although mortality due to infection did not rank highest among the causes of death, it clearly explained a large part of the mortality, in particular the gap between Jews and Arabs [8]. The committee members agreed that this issue was most urgent and should be addressed first. Moreover, it was considered relatively easy to handle compared with congenital defects.

An evaluation of infections in the Arab population demonstrated that they occurred at two seasonal peaks. At the height of summer the main cause was acute gastroenteritis and in winter the causes were upper respiratory tract infection and hypothermia (accounting for about 20 of 182 infant deaths in the year preceding the program). In March 1989, after conducting a

survey in a representative sample of the population on knowledge, attitudes and behavior regarding acute gastroenteritis, we began to plan an intervention. From the survey results we learned that the Arab population lacked sufficient knowledge on the causes of the disease, the ways in which it is transmitted, its treatment, and its prevention. It was decided to create a health education program that would include new mothers and mothers of infants, and recruit any community resource that might help. The limited resources available to the committee necessitated the use of appropriate epidemiologic information in order to focus the intervention plan. It was observed that 80% of the cases of death from infections were concentrated in six large villages from among dozens of Arab villages in the Western Galilee.

Professionals should be alerted by the unusual increase in infant mortality in 2002

Posters and booklets were compiled by professionals on the committee and by volunteers to provide information on the prevention and treatment of acute gastroenteritis. The information materials, user-friendly and in an impressive visual format, included mostly messages about preventing and treating diarrhea by drinking water, as well as information on the need for timely treatment to avoid complications (such as hypothermia). Many of the messages were taken from Muslim holy books, following consultation with religious leaders. The materials were distributed to all Arab new mothers at the central hospital in Nahariya and to mothers of infants through postnatal care stations and Clalit Health Services clinics. In addition, high school students in the six villages were recruited for door-to-door delivery of brochures. Frontal meetings with groups of 10–15 new mothers were conducted in these villages by postnatal care nurses, who emphasized the messages, such as refrigeration of food and personal hygiene by all who take care of infants.

The outcome

The project's success exceeded all expectations. Word of the program spread to every village in the Western Galilee, and we were obliged to distribute the information materials throughout the area. That summer, infant mortality from acute gastroenteritis in the Western Galilee fell to 0, and did not reappear as a public health problem in the subsequent 10 years.

This success prompted the committee to conduct a similar project in the winter for the prevention of upper respiratory tract infection and hypothermia. Material on these subjects was distributed in maternity wards, maternal and child health stations of the Ministry of Health, and Clalit Health Services clinics in the Arab villages in the Western Galilee. This project also proved successful, culminating in the elimination of these conditions: a reduction from 11 cases in the previous year to 1 in the program year and no cases at all in the next 10 years. During this time, ongoing monitoring by the committee was

Table 1. Average annual rates of infant mortality in Israel, 1985–1989

Area	Total	Jews	Arabs
All Israel	10.8	8.7	17.1
Northern district	14.1	9.2	17.5
Acre region	15.5	8.5	18.0

* Rates for 1,000 live births

conducted to ensure that mortality due to these infections had indeed disappeared completely.

An examination of infant mortality and its distribution according to ethnic origin in the year following the intervention plan unequivocally shows the disappearance of these infections as a main cause of death [8]. This established the role of infections as a cause for infant mortality in this population, which was similar to other Arab populations in number and character.

The committee received additional funds to continue its activities. The committee's efforts now focused on reducing the number of congenital defects and their obstetric causes. Among the obstetric causes, a significant factor that led to complications was identified in many home births (about 20%). This prompted intervention by the prevention staff at the Maternal and Child Health stations to emphasize the importance of delivery in a medical facility, as well as timely arrival at the hospital. Within 2 years, home births had become sporadic in the Western Galilee Arab population (less than 1%).

The prevention of congenital defects demanded a two-phase approach. Since we knew that most congenital defects are due to consanguineous marriages [9], we formulated a long-term plan extending for generations in order to bring about a behavioral change regarding a custom rooted in Arab society that was based on a traditional as well as economic rationale. The committee decided to leave this issue to the last phase of the plan but to try to find an immediate solution, albeit partial, to the problem of congenital defects.

The solution chosen applied a distinctly epidemiologic way of thinking. In a case-finding process for early detection and treatment, risk groups were selected to undergo ultrasound scanning in order to identify congenital defects. These groups included pregnant women who were married to their first- and second-degree relatives (about 40% of the Muslim and Druze population and 70% of the Bedouin population) as well as Arab women who had previously given birth to an infant with a congenital defect.

A modern vaginal ultrasound apparatus was purchased with funds raised specially for the project. The apparatus was placed in the maternity ward of the Nahariya hospital (the first of its kind in the hospital). Clalit Health Services undertook to finance each examination up to a certain sum, and a specialist physician was engaged. In addition, a team comprising a specialist, a nurse, a social worker, and a Muslim and a Druze religious leader was set up to persuade the mothers to undergo an abortion in the event of early detection of a major defect known to be lethal*. This project continues today, and according to reports and estimates it has led to early detection and termination of pregnancies with defects in many cases (30–40

cases each year in the first 5 years). This has greatly reduced the gap in infant mortality between the two populations under consideration. It should be mentioned here that this project was functioning many years before the folic acid program was initiated by the Ministry of Health.

Two years after the initiation of this short-term project for the early detection of congenital defects and pregnancy termination, the committee proceeded to long-term thinking – namely, restricting the custom of consanguineous marriages and the resultant significantly high incidence of infant mortality. Along with the committee, and the heightened awareness of this issue, other health agencies began operating in this area, as well as members of the media and of Arab society as a whole.

Infant mortality can be reduced by simple but creative measures and must be monitored constantly in populations at risk

Accordingly, the Northern district of the Ministry of Health initiated an extensive all-district project to reduce the phenomenon. This included numerous study days for health personnel with presentations by professionals, as well as reports in the mass media. The main message to emerge from the committee, supported by its intensive activity to encourage the issuing of a ruling (*fatwa*) by Muslim religious leaders in major mosques – Al-Aqsa in Jerusalem and Al-Azhar in Cairo – was that consanguineous marriages are not a Divine decree. They are not part of the Islamic religion, are indeed harmful since they cause morbidity, and should be avoided.

In addition to health professionals, most of the activity in this area recruits teachers at elementary and high schools, religious leaders at the mosques, as well as influential people in the community, to help disseminate the information. Attitude changes and an increase in knowledge regarding the damage caused by consanguineous marriages have already been observed in many evaluation surveys. The effect on the reduction of the rates of consanguineous marriages should be observable within years, and the effect on infant mortality, within generations.

Table 2 shows the present situation regarding infant mortality in the region, with the change between the years 2001 and 2002 throughout the country and in the relevant district.

Table 2. Annual infant mortality rates, 2001, 2002

	Total	Jews	Arabs
2001			
All Israel	5.1	3.9	7.8
Northern district	5.4	3.1	6.5
2002			
All Israel	5.5	4.0	9.0
Northern district	6.9	5.4	7.8

* Rates for 1,000 live births

* Of over 4,000 pregnancies in the Arab population in the area, 1,200 were eligible for the ultrasound project. A high compliance of over 70% was noted, which can be attributed both to persuasion by local medical and religious teams and to the fact that the examination was free of charge.

Conclusions

The present article on the reduction of infant mortality rates using epidemiologic and public health work methods is intended both to sound the alarm with respect to the change in infant mortality in 2002 and to maintain the momentum of the processes that were active during the past decade.

From an epidemiologic perspective, the three main causes for the gap in infant mortality between the Jewish and the Arab populations were addressed in order to narrow and ultimately close it. The source of post-neonatal infections has almost disappeared. By means of a process of case finding for early detection and pregnancy termination, major and lethal congenital defects may be diagnosed before birth. The obstetric factor of home births was likewise tackled and is no longer practiced. In parallel, the obstetric diagnostic process at the central hospital in the area has been improved.

The remaining differences between the two populations are only treatable in the long term, in terms of lifestyle, particularly by abolishing the custom of consanguineous marriage, which not only is medically contraindicated but is unacceptable in terms of Islamic law. This issue is already being addressed.

References

1. Beol AC, Co JP, Dougherty T, Kam J, Perrin J, Palmer RH. Quality measures for children's health care. *Pediatrics* 2004;113:199–209.
2. Wise PH, Pursley DM. Infant mortality as a social mirror. *N Engl J Med* 1992;326:1558–60.

3. Sohler NL, Arno PS, Chang CJ, Fang J, Shechter C. Income inequality and infant mortality in New York City. *J Urban Health* 2003;80(4):650–7.
4. Zlotogora J, Leventhal A, Amitai J. The impact of congenital malformations and Mendelian diseases on infant mortality in Israel. *IMAJ* 2003; 5:416–18.
5. Ezzati M, Lopez AD, Rodgers A, Vander Hoom S, Murray CJL. Selected major risk factors and global and regional burden of disease. *Lancet* 2002;360:1347–60.
6. Israel Ministry of Health, Public Health Services, Department of Mother and Child. Report on National Data on Infant Mortality in Israel, 2002. Published in 2003.
7. Israel Central Bureau of Statistics, Israel Ministry of Health. Socio-Demographic Characteristics of Infant Mortality. Data for 1980–1984. Jerusalem, 1989.
8. Israel Central Bureau of Statistics, Israel Ministry of Health. Infant Mortality Data for 1985–1989. Special series No. 932, Jerusalem, 1993.
9. Jaber L, Romano O, Shohat M. Consanguinity among Arabs in Israel. *Harefuah* 1997;133:345–8 (Hebrew).
10. Amitai J, ed. Ministry of Health – National Report on Infant Mortality 2001–2002.

Correspondence: Dr. A. Strulov, School of Public Health, Faculty of Social Welfare and Health Studies, Haifa University, Mount Carmel 31905, Israel.

Phone: (972-4) 832-0734

Fax: (972-4) 832-4583

email: astrulov@univ.haifa.ac.il

Capsule

Ebola virus cell invasion

Infection with Ebola virus causes a severe and often fatal hemorrhagic disease for which there is currently no effective treatment. The molecular mechanisms by which Ebola virus enters host cells and initiates infection are poorly understood. Chandran and team show that the endosomal protease cathepsin B is an essential host factor for Ebola virus infec-

tion that facilitates viral entry by cleaving a specific protein, glycoprotein GPI, on the surface of the virus. In a cell culture model, inhibitors of cathepsin B activity reduced the production of infectious Ebola virus.

Science 2005;308:1643

Eitan Israeli

Capsule

Expanding the professional cell staff

Antigen-presenting cells (APCs) chew up proteins and offer the resulting fragments of peptide, along with a suite of stimulatory molecules, to cells of the T cell receptor (TCR) lineage to produce activated T cells armed and ready to clear the corresponding infection. A few cell types are known to be potent "professional" APCs, and at the very top of the stack are dendritic cells (DCs). Brandes et al. include in these cells a subset of non-conventional human T cells bearing the TCR. These cells react vigorously to microbial stimulation and when

induced to do so in cell culture, became extremely efficient at presenting different types of antigen to their T cell counterparts. The cells appeared to traffic antigen to the same cellular compartments as DCs and up-regulated an equivalent array of stimulatory and homing molecules. As well as contributing directly to innate immunity, T cells may also represent important instigators of adaptive immune responses.

Science 2005;309:264

Eitan Israeli