Shoah Syndrome: Diabetes and Malignancy in the Ghettos during World War II, Contrasting with the Increased Prevalence during the Later Life of Survivors

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ABSTRACT In this study on Holocaust (Shoah) survivors, we reviewed accumulated data demonstrating an increased incidence of diabetes and cancer in the later years of survivors. We evaluated the status of high nutrition, compared to the low incidence of the same morbidities affecting the prisoners in the ghettos of World War II, while experiencing severe nutritional deficiency. The assumption of the high glucose requirement of cancer cells is discussed.

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KEY WORDS: cancer, diabetes, high nutrition, Shoah Syndrome, starvation

The Shoah Syndrome emerging from the Holocaust was defined in 2021 by a three-member research group as comprising psychological changes, metabolic aberrations (cardiac, hypertension, diabetes), and bone density loss [1]. Subsequently, malignancy was added to the syndrome.

We compared data on the high incidence of diabetes and malignancy during full nutrition in later life, contrasting with available data on the low incidence of these two diseases during the low nutritional time during life in the ghettos. We discussed the concept of cancer dependence on high glucose supply, which was first enunciated by Nobel laureate, Otto Warburg. Our conclusion is that the Holocaust was a significant and independent risk factor for the development of late age onset of malignancy.

HISTORICAL BACKGROUND

It was not expected that the suffering of the incarcerated during WWII would cease with the prisoners' liberation at the end of the war. Emerging from the Ghettos, the concentration camps, and the extermination camps, the immediate problems of the survivors were psychological and the problems inherent in replacing nutritional deficiencies in the starving people through careful refeeding and in controlling infections [2,3].

EARLY-ONSET SHOAH DISEASES

The early onset of Shoah diseases were infectious diseases (e.g., tuberculosis, skin infections, gastric [Helicobacter pylori]), intestinal (e.g., dysentery, typhoid), bone synthesis (e.g., osteomalacia, vitamin D, calcium deficiency), and delayed puberty or amenorrhea.

Within 3 years after the war, the survivors from holding camps in Europe either returned to their countries of origin, moved to the future Jewish state, or were dispersed in Europe, the Americas or Australia. The medical literature (from which only illustrative samples are selected) documents a variety of additional diseases in the population cohort, with resultant increased morbidity including slightly extended longevity [4-6].

The increased incidence of diabetes and malignancy in the later life of the survivors compared to their incidence in matched Jewish communities not connected to the Shoah and to non-Jewish communities stands out [7-11].

In our literature search (i.e., PubMed and Google Scholar), we noted that Stessman [3] reviewed the morbidities of survivors 50 years after the war. He reported no evidence that the Holocaust had any negative influence on physical health.

Approximately 70 years after the war, Stessman [4] reported that after age 85 there was a significant impairment of health in this unique population with their disease states expanding and their suffering manifesting within the complex.

LATE-ONSET SHOAH DISEASES SYNDROME

By 2009, the higher incidence of lung and colorectal cancer in Holocaust survivors compared with the non-Shoah connected Jewish population was well documented [5-11] [Table 1, Table 2]. In 2011, researchers indicated similar late effects among Australian Holocaust survivors [8].

More evidence of the increased presence of malignancy in the Shoah population came in 2016 when a higher incidence of colorectal, prostate, and lung cancer diagnoses emerged from a male only cohort study [9]. Those findings were further corroborated by an important report in 2017 by Sadetzki et al [10], who showed a 22% incidence of lung and colon cancer in survivors in contrast to 16% in a matched non-Shoah related Jewish population [10].

In 2019, Fund and colleagues [11] compared mortality and co-morbidity between Shoah survivors and non-Shoah connected Jewish populations. They noted a higher incidence of malignancy in the former, but with a slightly longer survival rate [11].

Among the multitude of articles dealing with late-onset Shoah morbidities, the extensive review by Virgilio and co-authors [12] in 2021 was definitive. They reviewed

Table 1. Publications on late onset diseases: a summary of the quoted literature

Number	Year	Author	Manuscript	Contents
1	2008	Stressman [3]	50 years post Holocaust	Morbidity in old in Israel
2	2009	Keinan-Boker [5]	65 years, Israel	Lung, colon cancer
3	2011	Paratz [8]	60 years, Australia	Increased morbidity
4	2014	Berkovich [6]	70 years, Israel	Increased morbidity
5	2015	Keinan-Boker [7]	70 years, Israel	Increased morbidity in second generation
6	2016	Keinan-Boker [9]	70 years, Israel	Increased lung, colon, no prostate
7	2017	Sadetzki [10]	70 years, Israel	Enhanced cancer, increased longevity
8	2019	Fund [11]	73 years, Israel	Increased morbidity, higher cancer
9	2021	Virgilio [12]	74 years, Israel	Significant association Shoah-cancer
10	2023	Stessman [4]	77 years, Israel	Increased morbidity, and longevity

Table 2. Publications on diseases in the ghettos

Number	Year	Author	Manuscript	Content	Journal
1	1943–1944	Ringleblum [19]	Warsaw ghetto archives	Studies on life, diseases	Warsaw Institute
2	1947	Wetterwald [28]	Archives, Ebensee Arolsen	Diabetes, not recorded few cancers	Praxis
3	1967	Seidman [20]	Warsaw ghetto	No cancer recorded	Targum
				Diabetes not recorded	Press
4	1979	Winnick [21]	Hunger disease	No statistics on diabetes, cancer	Wiley Press
5	2013	Weisz [22]	Research in Warsaw Medical School	No statistics on diabetes or cancer	*IMAJ*
6	2023	Weisz [23]	Lodz ghetto	No diabetes recorded, few cancer	*IMAJ*
7	2023	Weisz [22,23]	Studies on Kovno ghetto Kovno, Lvov, Vilna	No record of diabetes or cancer	*IMAJ*
8	2025	Weisz [29]	Mauthausen	No diabetes mellitus 2, cases of cancer	*IMAJ*

IMAJ = Israel Medical Association Journal

the incidence of solid tumors between the Shoah surviving Jewish population with non-Shoah related Jewish and a non-related non-Jewish population. The study concluded that the Holocaust is a significant and independent risk factor of late-onset malignancies.

THE CONNECTION BETWEEN HIGH LEVELS OF GLUCOSE AND MALIGNANCY

A Jewish predisposition to diabetes was already postulated in the 20th century [13]. The connection with cancer was made by Otto Warburg (1883–1970), a scientist in Berlin's Institute of Cell Physiology. He discovered that malignant cells needed a high level of glucose. This condition is known as the *Warburg effect* [14.] This concept could explain the higher incidence of diabetes and cancer during the high nutritional later life [15].

A comprehensive review by Johnson and colleagues [15] described the interdependence between hyperglycemic conditions in Shoah survivors in their later years and the parallel increase in cancer.

The origin of increased cancer incidence as a late onset disease was thought to be multifactorial: metabolic (cancer cells requiring more glucose) and toxic environmental impacts with possible epigenetic changes [14-18].

With the high incidence of the double pathology in later, high nutrition life, what could be expected of the incidence of the same morbidities during war time starvation?

Corresponding with the nutritional conditions during the war, a low incidence of both diabetes and cancer would be expected. Observations came from various surviving medical records, recorded by medical professionals and from historians.

THE RESULTS OF THE GHETTO RECORDS

Personal medical observations and records from the ghettos would be the most reliable. In fact, an extensive review of the archives and chronicles from the ghettos in Poland show an absence of diabetes and malignancies. In a general review of medical documentations from the ghettos, there was almost no incidence of diabetes and a scarcity of malignancy recorded in the study of a population totaling close to a million incarcerated Jews.

Medical records derived from the Warsaw ghetto (containing 500,000 detainees) are recorded in the Ringelblum archives, which chronicled the population's medical records for a period of 4 years. The lack of any comment on the incidence of diabetes and malignancy, in contrast to the documentation on infections and malnutrition related diseases, is conspicuous [19,20].

The medical documentation and record keeping was conducted by 27 Jewish doctors in the Warsaw Ghetto's clandestine medical school. The records were originally written in Polish and later translated and interpreted by Winnick and associates in New York [21]. The records include laboratory investigations into glucose metabolism but contain no case reports of diabetes or malignancy.

The *Chronicles of Ghetto Lodz*, the records of the Lodz ghetto (160.000 detainees) [16], which was discovered after the war, was a 5-volume series published in Polish. These accounts detailed weekly records on medical issues. It recorded the daily numbers of deaths, births, suicides, and killings. It also included parallel hospital records [22,23].

These documents dealt with the period from early 1940 until the liquidation of the ghetto in July 1944. They were discovered after the German army left. The records deal with the entire population of the ghetto, which was initially 160,000 Jewish people. The records were compiled by a specific medical team within a total of 170 medical practitioners in the ghetto, mostly graduates of German universities [22-24].

There was a surprising lack of diabetes and even more surprising was the paucity of malignancies recorded. There was one case of unspecified malignancy early on. By 1944, there were two cases of cancer of the pancreas, one cancer each of the liver, colon, stomach, ovary, uterus, breast, and one unspecified. There was one case of metastases.

Parallel to these records were the hospital records indicating 16 cases of cancer over 4 years: four cases of breast cancer, three liver, three stomach, and one each of intestine, bladder, uterus, lung, abdomen, and leukemia [22-24].

It is possible that despite tedious recording, some cases of malignancy remained undiagnosed; however, it is also surprising that the chronicles did not record a single case of diabetes during the entire period, although three cases were found in the hospital records, likely keto-acidotic coma. The records from the Kovno ghetto (35,000 detainees), compiled by Dr. Elchanan Elkes, does not mention any cases of diabetes or cancer [25]. The records of the Lvov ghetto between 1941and 1944 (11,000 detainees) recorded by Dr. Marek Redner described infections and starvation but did not mention cases of diabetes or malignancy [26].

The records from Vilna ghetto in Lithuania (15,000 detainees) by Dr. Abraham Wajnryb described early cases of insulin dependence as not changing to non-insulin dependent diabetes. He recorded no cases of either diabetes or of cancer during the following 4 years [27].

Dr. Mark Dvorjetzki from Vilna provided the first post-war testimony. He was a survivor of 10 concentration camps, finally escaping from Dachau and liberated by Americans while hiding in a forest. In Paris in June 1945, Dvorjetzki published the first post-war medical description of Shoah diseases. Much later in Israel, he described the effects of starvation, pediatric conditions, and the complex refeeding process to avoid mortality; however, he did not mention diabetes or cancer [2].

The French surgeon and political prisoner Francois Wetterwald's observations in the Dachau concentration camp and in Mauthausen's Ebensee' subcamp, contain no mention of diabetes among the tens of thousands of detainees. Of the 682 surgical cases that he recorded, there was only one case of malignancy [28].

From Arolsen documents, *Surgery in Mauthausen*, we noted one case of male breast cancer and one unidentified abdominal malignancy among 5900 detainees who underwent surgery. This review spanned more than 5.5 years [29].

DISCUSSION

In this observational study we compared the low incidence of malignancy and diabetes within the nutritionally deprived ghetto prisoners during WWII to their higher incidence in the surviving population during their later life with its high nutritional support.

The low incidence of malignancy during the ghetto years supports the postulated metabolic effect, namely the dependence of malignant growth on the availability of high glucose intake [16,17], without intending or being able to exclude the additional effects of environmental and/or genetic factors in oncogenesis [18].

The higher incidence of diabetes and malignancy in the later years of the ghetto survivor population, when compared to both Jewish and non-Jewish cohorts without ghetto life adversity experience could be considered as a rebound phenomenon from starvation to overfeeding with or without the added deleterious effects of the deprivations of ghetto life.

In other words, based on statistics alone, the ghetto incarceration appears to have the effect of decreased diabetes and malignancy during incarceration, but an increase in these diseases some 80 years after liberation.

Our final impression from the records and literature, mostly from the extensive Virgilio study, is that malignant disease must be added as a late-onset disease to the general Shoah syndrome of psychiatric disturbance, metabolic disease (i.e., diabetes mellitus), bone genesis and malignancy.

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One could be a doctor by day, and by night a logician, or psychologist, a teacher or a writer. A writer, cannot treat a sick patient, but a doctor can write as much as he wishes."

Prof. Alfred Gilbert-Dreyfus (1902–1989), French endocrinologist, resistance fighter, and Nazi concentration camp survivor

Capsule

Immune cells get moving

Group 2 innate lymphoid cells (ILC2s) are primarily tissue resident and do not usually recirculate. However, during helminth infections, interleukin 25 (IL-25) can induce intestinal ILC2s to differentiate into an inflammatory phenotype of cells, which can then migrate to other distal tissues. **Ito** et al. reported in mice that inflammatory ILC2 transit from the gut to the periphery requires tissue-draining lymphatics. IL-25 drives the up-regulation of sphingosine-1-phosphate receptors 5 and 1 on these cells, which regulate intestinal egress to the lymph and trafficking from the lymphatics to the periphery in a multistep process. Disruption of inflammatory ILC2 migration by deleting these receptors causes delayed lung tissue repair after infection with parasitic worms.

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Capsule

Stuttering insertions in influenza

High-pathogenicity influenza viruses have not only been devastating the planet's wild and domestic bird populations, but they also represent a persistent threat of initiating a fatal human influenza pandemic. **Funk** and co-authors investigated how recombination of low-pathogenicity viruses is prone to incorporating sequences for the furin multibasic cleavage site in the hemagglutination gene, which promotes cell invasion by virus. The authors found that transient RNA structures in the virus replication machinery caused it to stutter on adenine-/uridine-rich sequences and allowed the nucleotide insertions that translate into the cleavage site. The authors suggest that these sorts of transient structures might also be present in other RNA viruses.

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