Extermination via starvation was described in detail as an alternative or precursor to the final solution during the Holocaust in World War II. The main causes of death in the ghettos were exhaustion, environmental conditions (inadequate protection in extreme climates), infectious diseases, or starvation. In a previous study on the Lodz Ghetto, the causes of death via typhus exantematicus, tuberculosis, and heart failure were investigated [1,2]. In this article, we introduce the topic of diabetes in the presence of starvation and assess the incidence of malignancies in the years 1941–1944. The findings from the Lodz Ghetto would retroactively support the Warburg theory.

Since the turn of the 20th century, Westernization, or the processing and the altering of food quality, has led to the development of significant pathology. Although the metabolic changes in Westernized society have led to increased longevity, it has also led to an increase in diabetes and cardiac morbidity. The abundant caloric intake has also facilitated the development of issues related to nutrition of malignant tissues [3].

In the late 19th and early 20th centuries, French physicians in North African colonies noticed the rarity or inexistence of cancer. This phenomenon was also observed by Albert Schweitzer in Gabon. These findings were later connected with the appearance of metabolic diseases. The list of indigenous people who succumbed to increased quantity and altered quality of food, thus turning them nutritionally into "civilized" societies, is long and fascinating both historically and medically. Examples include the situations of the Inuit people in Northern Canada, the Eskimos in Alaska, the indigenous Indians in northern America, and the Pima Indians in the southern states when comparing the differences of white Americans of European origin with those of African and Hispanic origins. The same effect was inflicted on the Bantu people in South Africa, the Australian Aboriginals, the Nauru Islanders, the Indians in the Himalayas, and the Indians in the Brazilian Amazons [4].

In 1890 at the Carlsbad Plaza Medical Spa & Wellness Hotel in Bohemia, Czechia, Dr. Joseph Seegen observed that a quarter of his patients were of Jewish origin. They were all overweight and inactive. He called the observation [4]. It was not long before racist theories were developed, becoming a cause of restrictions on immigration to the United States, with various epithets such as, “Jews are eating themselves to sickness, whilst the rest of the population is starving.” “The Hebrews are particularly prone to diabetes,” stated by the American clinician physician, William Osler in 1910 [4].

The final acknowledgement of the connection was declared in a combined publication from the American Diabetes and the American Cancer Society in 2010. The article stated, “Epidemiologic evidence suggests that people with diabetes are at significantly higher risk for many forms of cancer” [12].

These are detailed epidemiological and observational studies. Missing is the control study, which of course would be ethically unacceptable; therefore, the review of the ghetto document would be instructive.

THE SPECIAL CASE OF LODZ GHETTO
In November 1939, the invading Nazi army overcame the Polish Army. The Nazis occupied the city of Lodz, which had a population close to 700,000 citizens, a
quarter of them Jews. They renamed the city Litzmanstadt. In February 1941, the Jews were ordered into a ghetto that by May was surrounded by a wall, hermetically isolating more than 200,000 detainees. Approximately 30,000 individuals escaped to the east. The ghetto existed until its liquidation between 30 July and 4 August 1944 [13-16].

Some 877 detainees were left behind to clear up the remaining evidence of starvation, disease, and exterminations. Nachman Zonabend, an astute “cleaner”, discovered, buried, and after the war recouped the records. These records became known as Chronicle of Ghetto Lodz. They covered the years 1941–1944 with a daily record of events in ghetto life. The Chronicle included at least five daily reports per week on medical conditions, totaling some 1600 descriptions on diseases, births and deaths, suicide, and nutrition. The Chronicles were published in Polish. Later, an abridged volume in English was published in 2007, and a more detailed version in German was published in 2010 [13].

RESULTS

The first observation of general interest was in volume 1, dated 12 January 41, which recorded 14 newborns and already one suicide. The last record of a birth, dated 29 July 1944, noted a non-viable newborn, and the last suicide was recorded on 30 July 1944, one day before the final liquidation. Starting in May 1940 there was excessive demand on the 170 doctors and the five hospitals: three general hospitals in addition to one for infectious diseases and one for psychiatry.

The aim of this article was to investigate diabetes in the face of starvation in the Lodz Ghetto and the incidence of malignancies. We reviewed the five volumes of the Chronicles (totaling 2070 pages) and in the abridged volume in English (535 pages). Findings included:

- No diabetes diagnosed during the 3.5 years of the Chronicles; however, the death records reported at the hospital recorded 602 cases and three cases of diabetes.

Regarding the malignancies, in the first 2 years the Chronicles recorded one case of unspecified cancer and in 1944 two cases of cancer of pancreas, one each of liver, colon, gastric, ovarian, uterus, breast, one unspecified, and one generalized cancer. In parallel, in the hospital records, there were total of 18 cases: four breast cancer, three liver and gastric, and one in each intestine, bladder, uterus, lung, abdomen, and leukemia.

DISCUSSION

Starvation as a weapon in war is an old mechanism of submission or extermination to be found throughout history. A long list of exterminations could be constructed from history, none more industrialized, more extensive, and more successful than those in the Nazi subjugated countries during WWII. The total number of casualties is not known, but it numbers in many millions of humans and was premeditated. In addition to the initial starvation of the prisoners, starvation and famine also reached the occupying army and eventually the German civil population [16,17].

The ghettos that Nazi occupiers organized were meant to be transfer camps, first to exploit the work of the potential healthy detainees but gradually offering reduced nutrition leading to starvation and then eventually to join the rest of the unable to work (old, young, or sick) on their way to the extermination camps.

Lodz enjoyed a high efficiency textile industry, leather products factories, and metal processing facilities. Initially the occupiers used the existent labor force but gradually offering food that we Germans give is for healthy, industrious people, those who work for the army. The sick are nothing but burden for the ghetto. They must be gotten rid of.” Indeed, patients from the Home for the Crippled were shot.

The food supply was insufficient both in quantity and quality and was gradually diminished. Once the detainees became sick, were replaced by newcomers. The textiles, leather, and metal factories were never short of workers. Starvation and death were a daily event and were recorded by some 170 well-trained and experienced physicians working in the ghetto’s five hospitals or in private clinics. Nevertheless, some cases remained unrecorded, and some
individuals perished on the streets.

What can we learn from the unfortunate experience of the Lodz Ghetto? How can the lack of diabetes and the very low incidence in malignancy be explained? There is a need to consider the Warburg Effect as a probable explanation.

THE WARBURG EFFECT

The Nobel laureate, Otto Heinrich Warburg, Head of the Cell Physiology Institute in Berlin in the 1920s researched the glycolysis as a source of energy in normal and cancerous cells [18]. The discovery of fermentation rather than oxygenation of glucose, and more so fructose, in cancer cells was expected to influence future treatment for malignancies.

Warburg’s theory was somewhat left cold during and soon after WWII, perhaps related to the fact that Warburg was 50% Mischling Jew (father and four grandparents). He remained nonetheless in place un molested, whilst numerous other researchers were persecuted during the Third Reich. He was accused of collaboration, was eventually rehabilitated, and accepted in the world of science [18]. His theory was revived, extended and the theory of alternative therapy preventing the ravenous metabolism of malignant cell was to be applied to oncotherapy [20,21].

CONCLUSIONS

Associating the starving ghetto population, with its surprising lack of diagnosed diabetes and with a very low incidence of malignancy during the 1940s, with another population later in the century, would not be acceptable. Nonetheless, both populations were based on the same metabolic and nutritional background before exposure that would perhaps allow some association. Although no absolute proof has been found, the findings during starvation would be supportive of the Warburg theory of associated diseases and might lead to a combined prophylactic treatment. These findings could benefit survivors by addressing, and thus working to prevent, the development of transgenerational multi-system Shoah syndrome in survivors [22].

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