

Enhancing body immunity using fortified bread: Corona patients as a case study

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Abstract

This study aimed to investigate the effectiveness of fortified bread against common diseases such as Corona. This research was based on the fact that vitamin and mineral deficiencies are mainly the causes of many diseases. However, malnutrition can be combated by fortifying daily eaten foods. One of the basic criteria of food fortification is the selection of appropriate food ingredients. The chosen ingredients must be from the food commonly eaten by the targeted group of people (Corona patients aged between (20 -70) years old). Moreover, these ingredients must be economically afforded and available throughout the year. Flour and bread made from it are the best food items for fortification because they fulfill these requirements. The importance of this research comes from that it proposes a process of food fortification and enrichment it where it was conducted in two stages First step is fortifying bread by adding iron and zinc due to the loss of these two elements during the milling process. The second step is obtaining flour and enriching it with vitamin (C) due to the lack of this vitamin in the composition of flour. A remarkable improvement was reached after eating the fortified bread. Positive indicators were obtained revealing improvement of patients' conditions and occurrence of recovery. These indicators include decrease in the percentage of neutrophils which was high during infection before eating the proposed fortified bread. The range of this value was (74-48)% before eating the proposed fortified bread. Moreover, the percentage of lymphocytes increased and became in the range (20-48%)

Key words: Iron - Zinc - Corona (covid -19)- Neutrophils- Lymphocytes- NLR.

Introduction:

Iron deficiency according to the World Health Organization is the most common nutritional disorder in the world, [Turner et al, 2005]. Vitamin deficiencies also play a role in the global disease burden, particularly zinc and vitamin C. These deficiencies may contribute to a deterioration of human immune system and increase levels of inflammation. [Fantacone et al, 2020].

The COVID-19 epidemic which was reported in Wuhan, China, has spread to many continents and countries causing severe public health burden. [Cheng et al, 2020]. It is a viral respiratory disease and may progress to acute respiratory distress syndrome [Borges et al, 2020].

Among the elements that mostly studied is vitamin C, an important vitamin for neutrophil phagocytosis, and antimicrobial activity. [Fantacone et al, 2020]

It has also demonstrated appropriate therapeutic safety properties in a wide range of clinical applications. Since it takes time to develop effective vaccines and antiviral drugs, vitamin C is

among the currently available agents used in research aimed at alleviating acute respiratory distress syndrome associated with the coronavirus. [Hoang et al,2020].

Interestingly, most of the symptoms of COVID-19 have been linked to altered zinc balance.

Thus zinc supplementation can be considered as a therapeutic, cost-effective and available approach for patients with COVID-19. [Wessels et al,2020].

It is well-known that the pathophysiology of Coronavirus disease 2019 (Covid-19) is not clearly defined. Among the proposed mechanisms for monitoring human immune system impairment, dynamic monitoring is one of the indicators for assessing disease severity and prognosis for COVID-19 patients as rate monitoring (neutrophils, lymphocytes, NLR (the ratio of neutrophils to lymphocytes), which is useful in developing treatment strategies. [Rezaei et al, 2021] [Deng et al, 2020].

Recently, there has been a trend to search for alternative treatments for illnesses and diseases through food due to the following reasons.

- Existence of nutritional problems.
- Body's lack, in some cases, of many nutrients and its reflection on people health.
- Incidence of diseases.
- High prices of medicines.
- Difficulty and fear of obtaining a vaccine.

In this research, bread has been fortified with iron, zinc and vitamin C (ascorbic acid) based on the importance of this vitamin and these two elements in treating many diseases and giving human body immunity against infections.

Experiments were conducted by giving fortified bread to Corona patients and monitoring their health conditions under supervision of a specialized doctor.

Periodical laboratory tests were performed on the patients before and after eating the proposed fortified bread. The main focus was on the immune system's indicators such as (neutrophils, lymphocytes-and NLR).

Success of the proposed fortification process was experimentally confirmed

Materials used

Wheat Flour, Bread Yeast, Zinc Oxide (ZnO), Ferrous Sulfate (FeSO₄.7H₂O), Vitamin C (Ascorbic Acid).

Producing fortified bread

Fortifying process was performed in an automatic oven according to the conditions followed within automatic ovens at a temperature of 700°C for a period of 15 seconds. The doses recommended by the Ministry of health to prevent Corona disease were reviewed ((Vitamin C: 500 ppm - Fe: 20ppm - Zn: 50ppm). Conducting experiments by giving this fortified bread to a target segment (corona patients) and monitoring their health condition under the supervision of a specialized doctor (Dr .Mazhar Shaheen) . Laboratory analysis were conducted for these people before and after eating fortified bread focusing on basic indicators while observing the improvement of clinical symptoms

Experimental study

The experimental study was conducted by giving the proposed fortified bread to a target group of corona patients (19 patients aged between 20 -70 years old). They were given fortified bread meals on a regular basis

Laboratory (Medical) Analysis

Laboratory analysis was conducted for the chosen patients before and after eating the fortified bread focusing on basic indicators while observing the improvement of their clinical symptoms.

Results and Discussion

A remarkable improvement was reached after eating the fortified bread. Positive indicators were obtained revealing improvement of patients' conditions and occurrence of recovery. These indicators include decrease in the percentage of neutrophils which was high during infection before eating the proposed fortified bread. The range of this value was (74-48)% before eating the proposed fortified bread. Moreover, the percentage of lymphocytes increased and became in the range (20-48%). It must be mentioned that the percentage of lymphocytes was low during illness where the virus attacked them and destroyed them. It should be noticed that there was decrease in NLR (ratio of neutrophils to lymphocytes) values. These values ranged between (1-4) after eating the proposed fortified bread.

These results were positive indicators of a significant improvement and recovery in the targeted Corona patients. Clinical symptoms of the patients improved. Therefore, success of the fortifying process was confirmed from an applied (medical) point of view.

Monitoring neutrophils and lymphocytes rates in Corona patients before and after eating the fortified bread:

The two types of blood white cells (neutrophils and lymphocytes) were focused on as the basic immunological indicators to assess disease severity or improvement and recovery. As the virus destroys lymphocytes and decreases their number, low lymphocyte levels are associated with severe disease and death in COVID-19 patients.

Rate of neutrophils to defend the body increases according to the severity of the viral infection. When recovery occurs and the disease recedes, the neutrophils decrease and the lymphocytes rise.

A-Neutrophil Monitoring

Neutrophils are immune cells. They are the main factor in immunity and their primary function is to remove pathogens through phagocytosis [Borges et al, 2020].

Figure (1) shows Monitoring the low rate of neutrophils in Corona patients

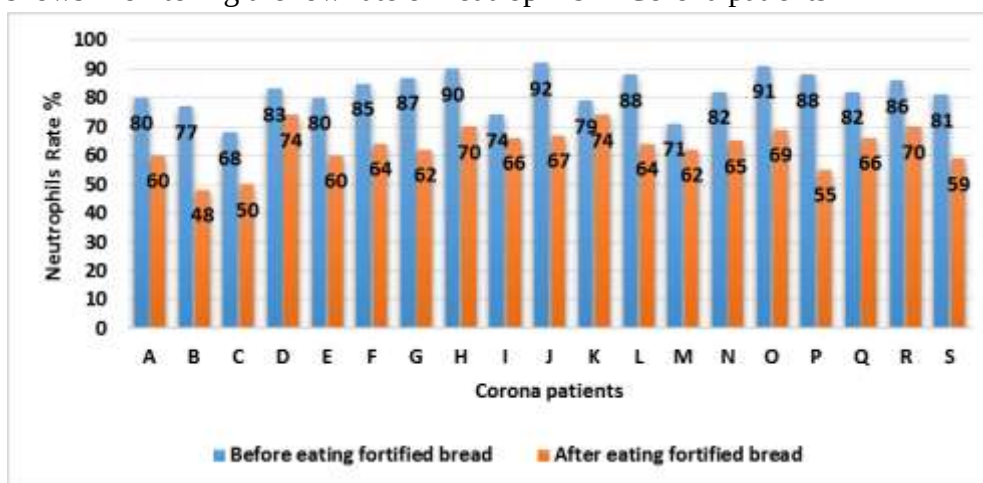


Figure (1): Monitoring the low rate of neutrophils in Corona patients

Figure (1) shows decrease in the rate of neutrophils and their survival within the normal limits (30-70%) after eating the fortified bread.

It is clear that the decrease in the rate of neutrophils was observed after improvement and recovery. Borges and coauthors study reported that patients with severe COVID-19 infection may have defect in the immune response. This issue exacerbates hyper-inflammation hypothesizing that neutrophils can amplify pathological damage or control other cell subsets. Depending on the characteristics of the infection and it was reported that after acute inflammation caused by immune processes, such as viral infections, these neutrophils return and **their number decreases**. This conclusion is consistent with the results shown in Figure (1) of the proposed research [Borges et al,2021]

B-Lymphocyte Monitoring

Lymphocytes circulate throughout the body helping the immune system fight against infections [Orakpoghenor et al,2019.]

Figure (2) shows Development of Lymphocytes rate in Corona patients

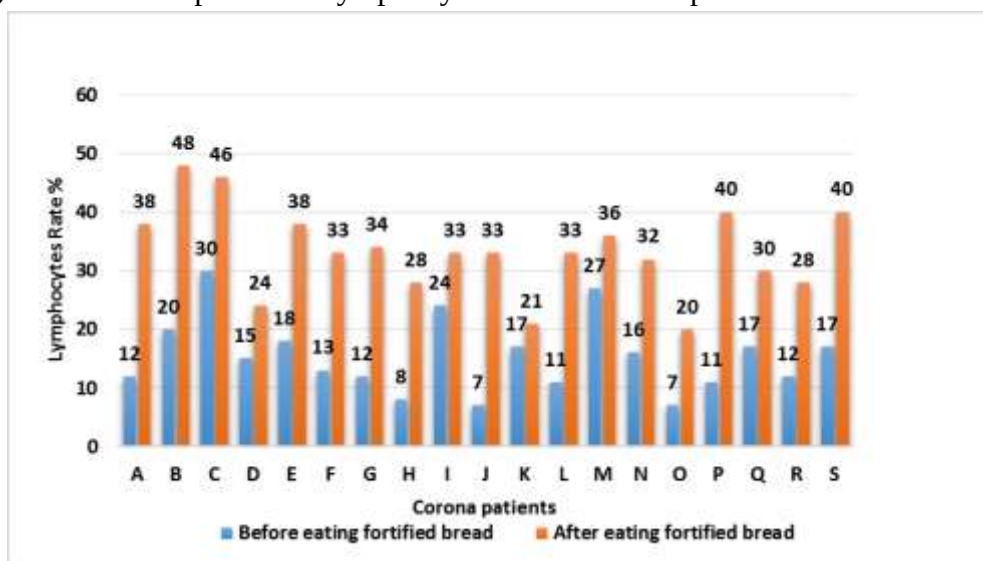


Figure (2): Development of Lymphocytes rate in Corona patients

Figure (2) shows the high lymphocyte rates and their survival within their normal range of (15-40)% after eating the fortified bread.

Deng and coauthors study showed that lymphocyte values were lower in patients with severe disease compared to those with non-severe disease. These values also were lower for patients who died compared to those who recovered.[Deng et al,2020] This result is consistent with the results of this research shown in Figure (2). Laboratory analysis for Corona patients, in this research, showed a decrease in the rate of lymphocytes when infected with corona. On the other hand, **this analyzed parameter rose** when the disease declined and recovery occurred.

The numbers of these cells (Lymphocytes) correlate with the prediction of COVID-19 disease as well as its progression and severity.

Rezaei and coauthors study noticed that lymphocytes increased significantly in patients who responded either early or late, **with the aim of clarifying the characteristics and clinical significance of the lymphocytes changes during COVID-19**. The clinical response was defined as an improvement in symptoms (fever, cough, as well as saturation blood oxygen). Patients who met these criteria one week after admission were classified as early responders. Others who recovered and were discharged from hospital were classified as late responders. Patients who died were classified as non-responders. Comparing this result with the obtained results in this research the

focus was on the improvement of the clinical symptoms of patients with the improvement of indicators and laboratory analysis results [Rezaei et al,2021]

C- NLR Monitoring

One of the indicators of Covid-19 severity (poorer prognosis) is the high rate of NLR especially patients with severe cases compared to patients with moderate cases [Borges et al,2020]..

Figure (3) shows Decreased NLR values in Corona patients.

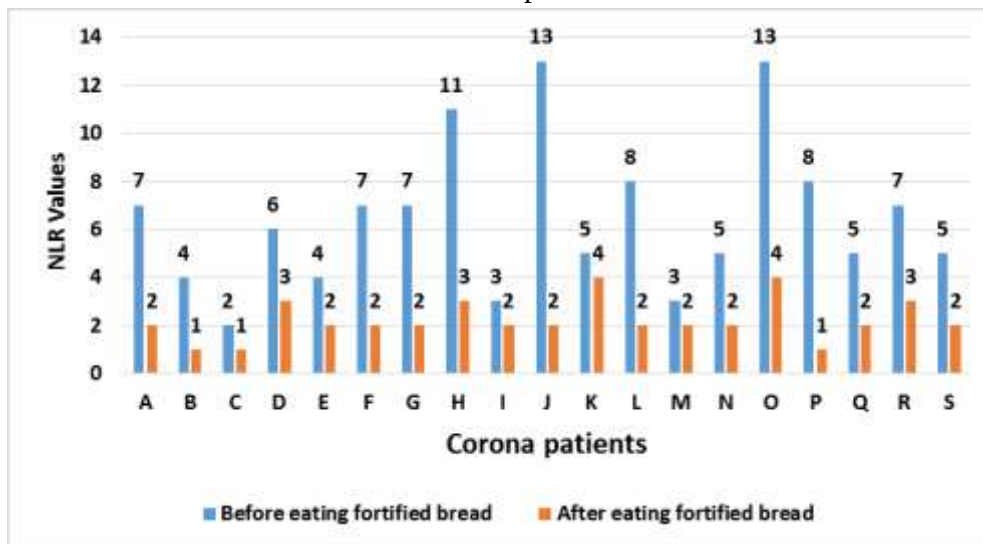


Figure (3): Decreased NLR values in Corona patients.

Figure (3) shows decrease in NLR values after eating the proposed bread. The decrease in NLR values indicates improvement and recovery. On the other hand, severe cases of the disease are with high values of NLR. This result is absolutely consistent with the results obtained by [Borges et al,2020]

Analysis results shown in Figure (3) are consistent with the study of Borges et al.,who studied 116 patients with COVID-19 and showed that they had higher NLR (neutrophil to lymphocyte ratio) .

Figure (3) shows NLR values in Corona patients before and after eating the proposed fortified bread. The decrease of these values after eating this bread indicates improvement and recovery. These values were high in the case of severe disease and this is consistent with what Borges et al,2020 mentioned.

Normal NLR values in healthy adults and non-elderly people range from 0.78 to 3.53.[Forget et al, 2017]. It has been noticed that analysis results shown in figures (1),(2), and (3) agree with the results obtained by Forget et al, 2017.

Therefore success of the proposed fortifying process has been confirmed from medical point of view.

Conclusions

The following conclusions can be drawn after completing this research.

- Fortified bread was produced. This bread is experimentally proved to be effective against some common diseases such as Corona.
- Effectiveness of this bread was justified practically by giving it to group of Corona patients.
- Success of the proposed fortifying process was shown from medical point of view.

- There was noticeable improvement in health conditions of patients who ate the proposed fortified bread. They have had positive indicators with improvement of the results of laboratory tests and clinical symptoms. These positive indicators show that there is recovery Corona. The obtained results may open new horizons for the prevention or treatment of acute viral diseases such as corona. They may keep people away from the use of expensive medicines and multi-source vaccines and may ensure food safety for the citizens.

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تعزيز مناعة الجسم باستخدام الخبز المدعم

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الملخص

تهدف هذه الدراسة إلى دراسة مدى فعالية الخبز المدعم ضد الأمراض الشائعة مثل كورونا. يعتمد هذا البحث على حقيقة أن نقص الفيتامينات والمعادن هو السبب الرئيسي للعديد من الأمراض. ومع ذلك، يمكن مكافحة سوء التغذية عن طريق تعزيز الأطعمة التي يتم تناولها يوميا. أحد المعايير الأساسية لإغناء الطعام هو اختيار المكونات الغذائية المناسبة. يجب أن تكون المكونات المختارة من الأطعمة التي تتناولها عادة الفئة المستهدفة من الأشخاص (مرضى كورونا الذين تتراوح أعمارهم بين (20-70) سنة). وعلاوة على ذلك، يجب أن تكون متاحة اقتصاديا ومتاحة على مدار العام. ويعتبر الدقيق والخبز المصنوع منه من أفضل المواد الغذائية للتقوية لأنه يفي بهذه المتطلبات. وتأتي أهمية هذا البحث من كونه يقترح عملية إغناء الغذاء وإثرائه في نفس الوقت. يركز هذا البحث على خطوتين. هذه الخطوات هي كما يلي. الخطوة الأولى هي تحصين الخبز بإضافة الحديد والزنك بسبب فقدان هذين العنصرين أثناء عملية الطحن. الخطوة الثانية هي الحصول على الدقيق وإثرائه بفيتامين (ج) لعدم وجود هذا الفيتامين في تركيبة الدقيق. وقد تم التوصل إلى تحسن ملحوظ بعد تناول الخبز المدعم. وتم الحصول على مؤشرات إيجابية تشير إلى تحسن حالة المرضى وحصولهم على الشفاء. ومن هذه المؤشرات انخفاض نسبة العدلات التي كانت مرتفعة أثناء الإصابة قبل تناول الخبز المدعم المقترح وكان مدى هذه القيمة (48-74)% قبل تناول الخبز المدعم المقترح. كما ارتفعت نسبة الخلايا الليمفاوية وأصبحت في حدود (20-48) %

الكلمات المفتاحية: حديد - زنك - كورونا (كوفيد 19) - العدلات - الخلايا الليمفاوية-

.NLR