GOATS AND SODA

People are dying of malnutrition in Gaza. How does starvation kill you?

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Hamza Mishmish, 25, of Gaza shows signs of severe malnutrition and bone loss in the Nuseirat refugee camp amid worsening hunger in the region. The date of the photo is July 27.

Hassan Jedi/Anadolu/via Getty Images

The boy made no sounds, recalls Dr. Ibrahim Alashi. Not a cry. Not even a whimper. Severe starvation had robbed him of even that, he says.

"When I first saw him, I was shocked. His body was extremely thin — extremely thin — just skin and bones," Alashi told NPR. He is a dentist who is seeing malnourished patients as a volunteer in a Gaza City clinic. "He had no energy to speak, barely any energy to even lift his knee."

The eerily quiet child was a 9-year-old boy whom Alashi treated. The boy, he says, lay limp in his mother's arms, his body ravaged by severe malnutrition.

The boy is one of the many thousands in Gaza suffering from what the U.N. is calling "catastrophic hunger" as a result of Israel's blockade and military offensive.

Catastrophic — and potentially fatal. The World Health Organization now says a "worst-case scenario of famine" has reached much of the region. In July alone, WHO reported that 63 Palestinians have died from malnutrition. The U.N. estimates 100,000 Palestinian women and children face severe malnutrition and a third of the population of 2.1 million hasn't eaten in days.

Gaza is not the only part of the world where starvation looms. The U.N. World Food Programme list of regions with the most people facing catastrophic hunger also cites Haiti, Mali, South Sudan, Sudan and Yemen. Conflict and climate conditions are typically the root causes.

With hunger crises unfolding across the globe, many people may be asking a terrible but timely question: What is it like to starve to death?

The five phases of starvation

Hunger is universal — even babies feel it. They first show it with subtle cues, like turning their head to look for a nipple or making sucking motions. If these go unnoticed and hunger grows, they cry.

"There's nothing quite like the cry of a hungry child. It's a completely unique sound that just somehow cuts right to your heart," Dr. Kevin Stephenson, a malnutrition expert at Washington University in St. Louis, says. He adds that the body's internal hunger barometer is essential for survival.

When hunger persists, starvation begins. It starts when people don't get enough calories to keep up with the body's energy needs. The cause can vary: food shortages, underlying infections, psychiatric causes like anorexia nervosa, impaired absorption of nutrients or an inability to ingest food.

In Gaza, the driving force is simply the lack of food. That's the quickest path to malnutrition — the clinical condition that results from prolonged starvation — because it results in an immediate and total cessation of energy and nutrient intake. With no external fuel, the body launches a cascade of survival mechanisms to stay alive.

The body's physiologic response is broken down into five metabolic adaptations. Each phase overlaps with the others and is characterized by shifts in the body's use of energy stores — carbohydrates, fats and protein as it strives to survive.

"If you're not eating enough, we have evolved mechanisms for how to stay alive," Stephenson says. "We basically eat our own body for nutrition."

Phase 1

The first phase of fasting is far from catastrophic. In fact, everyone feels it. You eat dinner, then sleep — and during the hours of slumber, the body turns to its most accessible fuel source: carbohydrates.

"The carbohydrate stores in our liver are like protein bars that our body has evolved to be able to tap into," Stephenson explains.

If food is not ingested the next day, the body consumes its carbohydrate stores, hunger sets in and weight loss begins. Sometimes, there may be stomach rumbling, caused by rhythmic contractions to clear any residual food from the digestive tract.

Phase 2

The carbohydrate reserves run dry by day one or two of food deprivation. This prompts a transition to phase two, where the body uses fats as its primary energy source. Because carbohydrate stores are depleted, the levels of sugar in the blood are low, which can cause fatigue, lightheadedness or dizziness.

Phase 3

Usually by the third day without food, the body begins the third phase of starvation: The liver begins to convert fats into ketones — energy-rich molecules that serve as emergency fuel for the brain. Some of the initial low blood sugar symptoms persist, but as ketone production ramps up the body compensates. Some individuals report greater mental clarity and a reduced desire to eat.

Despite the body's low blood sugar from depleted carbohydrate stores, signs of hypoglycemia like tremor, anxiety and sweating don't appear. That's because ketones provide an alternative energy source, preventing the warning signs of low blood sugar.

Phase 4

In the fourth stage, the body attempts to slam the brakes on starvation by lowering the metabolic rate — like switching on low-power mode to conserve energy. Heart rate and blood pressure drop. People cut back on physical activity instinctively but also because their bodies become weaker.

Hormone levels are adjusted as the body shifts into an energy conservation state: not because hormone production itself uses lots of energy but because the body prioritizes its most essential functions. Hormones that are important but not critical to survival are dialed down. Thyroid hormones drop, causing fatigue and lethargy, and reproductive hormones dip, which can lower libido and halt menstrual periods.

Phase 5

The depletion of fat stores can take anywhere from a few weeks to months, depending on the person's fat reserves. That's when the final phase of starvation begins as the body breaks down proteins from its own muscles.

"The body tries to preserve muscle as best it can because muscle is very metabolically demanding to build," Stephenson says. "But ultimately, though, it gives up and says, 'I'm gonna die if I don't get protein here.'" Once proteins are broken down, they enter the bloodstream and are used to fuel the body.

By this point, signs of muscle wasting and weakness appear. The body also produces less albumin — a protein that helps maintain fluid balance — leading to swelling in the legs and abdomen. Physical appearance changes noticeably: Skin becomes thin and dry, hair turns brittle, the eyes appear sunken and weight loss becomes more severe.

These physical changes eventually lead to severe malnutrition, which falls into two categories: marasmus and kwashiorkor. Marasmus is characterized by the body consuming its own muscle and fat, leaving patients frail with visible skeletal outlines. Kwashiorkor, on the other hand, results from a severe protein deficiency. It presents with swelling of the legs and abdomen.

This fifth and final phase — the breakdown of proteins for energy that's known as protein catabolism — varies in length. Adults can survive up to 60 days without any food as long as they have access to water, a time span based on case studies of hunger strikes. But eventually, the body shuts down.

As the body breaks down proteins in this final stage, vital organs like the heart aren't spared — the heart muscle thins and weakens. The immune system, gastrointestinal tract, liver and kidneys weaken, too. In this stage of starvation, death often comes from an infection the body is too weak to fight or from an

abnormal heart rhythm that can lead to sudden cardiac arrest. In these cases, starvation is still the underlying cause of death.

Not everyone is at the same risk of dying from starvation. The healthier someone is, the better their chances of survival. Also, certain demographics are at higher risk, like the elderly, people with preexisting conditions, pregnant people and children.

Pregnancy adds to the risks

Among the most vulnerable are pregnant people, whose bodies are under intense metabolic stress because of the need to nourish the fetus.

"The energy requirements of pregnancy make the need for adequate nutrition even more imperative," says Dr. Mariam Gomaa, an OBGYN from Washington, D.C.

Starvation reprograms some of the genes responsible for fetal growth, passing these modifications down to future generations. While the body tries to preserve the womb, there are limits to what it can do, Gomaa explains.

That uncomfortable reality is settling in for Alashi's pregnant patients.

"She looked very exhausted and incredibly frail," Alashi says of a patient he treated who was eight months pregnant. "What stayed with me was what she said before leaving. She said, 'I can survive hunger, but I don't think my baby can.'"

The timing of starvation in pregnancy is critical. If it occurs early in pregnancy, the effects on the fetus are most severe. Babies born to these mothers face many obstacles, including preterm birth, stunting, impaired immune function and long-term risks for noncommunicable diseases like diabetes.

After delivery, problems persist for the mom. Gomaa says malnourished moms often struggle with breastfeeding, which further compromises infant growth and immune function. If starvation continues after the postpartum period, moms are faced with agonizing decisions.

"If there are kids starving, their moms are starving, too," Stephenson says. "The mom is going to do everything she can to get her kids food. In some cultures around the world, unfortunately, the mom is the last person to eat."

Starvation hits kids hard

Kids are even more at risk of starvation than adults because of the demanding physiological requirements for growth and fewer energy stores. Last year, UNICEF estimated that 12.2 million children faced severe malnutrition, which is defined as children who are dangerously underweight for their height or age. South Asia was the hardest-hit region.

Stephenson says children can die within a week of eating little to no food, especially if they develop an infection, which further depletes energy stores and rapidly worsens their condition.

"It's so, so common to hear this story from a mom: 'My kid was irritable and felt hot. I took them to a local doctor, and within two hours, they were dead,'" Stephenson says. "When you have severe malnutrition, you're just on a knife's edge. It only takes one little thing for you to tip over."

Some kids with underlying illnesses — like pneumonia or diarrhea – paradoxically lose their appetite because their body decreases production of hunger hormones and a weakened digestive tract makes eating uncomfortable.

In even more severe cases, children can lose their ability to swallow. Swallowing dysfunction has multiple causes, but it's primarily driven by protein breakdown, which leads to muscle loss in the jaw, disrupted coordination of the swallowing reflex and difficulty using the mouth muscles needed for eating.

"Swallowing is so fundamental to survival, and so I think that speaks to how severe this condition is," Stephenson says. "Eventually, you can just get sick enough that the parts of your brain that stimulate you to eat stop working."

The treatment is simple: food and water. "It's not a mystery of how to treat this. There are lots of complicated things that we can't fix in the world, but severe malnutrition is not one of them," Stephenson emphasizes.

Many kids receive a peanut paste to help stave off starvation. For those who have lost their appetite or can't swallow, a feeding tube is usually required. These children are at a higher risk of refeeding syndrome, a dangerous shift in electrolytes that can cause abnormal heart rhythms.

If a child remains untreated, studies show that mortality rates for severe malnutrition can range from 10% to as high as 40%. Those who survive face long-term consequences, including stunted growth, developmental delays and increased risk of recurrent illness and mortality. Long-term studies link the effects of severe malnutrition in childhood to poorer test scores, lower educational attainment and difficulty keeping a job later in life.

"It is possible, if you get them through that one bad, worst period of their childhood, that they could be OK," Stephenson says optimistically. "All hope is not lost."

When a child reaches this level of malnutrition, their behaviors become antithetical to normal survival instincts — a pattern seen in adults, too.

"Kids with severe malnutrition can appear very apathetic, listless and uninterested," Stephenson explains. "It looks like they've given up, like they just have no energy to do anything. Even if inside they feel like they're dying in terrible pain, they can't even manifest a cry to signal to their caregivers that they need something."

Dr. Alashi, the dentist who volunteers at the Gaza clinic, recalls this disquieting quiet in the 9-year-old he treated. "What stood out most to me was how silent he was," Alashi told NPR.

"His mother kept crying, saying she hadn't heard him laugh or speak in days," Alashi adds. "We are watching the destruction of a generation."

Alashi diagnosed the boy with marasmus. Though the child is still alive, Alashi told NPR last Thursday that the youngster is "on the edge of death."