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# DEFECATION POSTURE – SITTING VERSUS SQUATTING

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**ABSTRACT**

**Background:** Despite emerging debates on what should constitute a recommended defecation posture the research in this area has been mostly non-conclusive. In the countries of Europe, America, Australia the sitting position forced by a design of water toilet prevails while in many Asia and Africa countries the squatting posture dominates. The postures have their distinctive impact on digestive, musculoskeletal, and overall body health. Both of them have advantages and disadvantages.
**Aim:** This systematic review aimed to critically evaluate previous research on the defecation posture. The comparison of changing the defecation position from squatting to sitting was performed and its effects analysed.
**Material and methods:** A search of relevant research databases was conducted as well as a hand search of selected journals to identify eligible papers.
**Results:** A total of 20 studies were reviewed and results indicated a mean prevalence rate of sitting posture between 10%–24%. Findings also indicated correlates such as the presence of health problems related to the defecation posture. Most studies showed poor external validity, with the majority of them scoring high on risk of bias.
**Conclusions:** Overall, the findings indicate inconsistencies in terms of methodology and diagnostic criteria of health problems related to defecation posture. Further research in this area using long-term clinical trials to avoid biases is recommended.

**KEYWORDS**

Defecation Posture, Water Toilet, Sitting, Squatting

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## 1. Introduction

The posture adopted during defecation has undergone a significant transformation throughout human history, particularly since the invention of the modern sitting toilet. The earliest known toilets date back approximately 4,500 years to the ancient city of Mohenjo-Daro, in present-day Pakistan (…). Since then, the seated position has gradually become the dominant posture in many parts of the world. Today, in highly developed countries such as the United States, most European nations, Japan, and Australia, the sitting toilet—which requires the user to sit at a 90-degree angle on an elevated toilet seat—is the standard fixture in homes and public facilities.

In contrast, the squatting position, in which the user crouches close to the ground with hips flexed and knees fully bent, is still commonly used in many low- and middle-income countries, including regions of Asia, the Middle East, Africa, and parts of Eastern Europe (…). In these areas, squat toilets, often consisting of a simple floor-level opening, remain prevalent. While squatting may seem less modern, it is in fact the historical norm of human defecation, and its physiological effects differ significantly from those of the sitting position (see Figure 1).

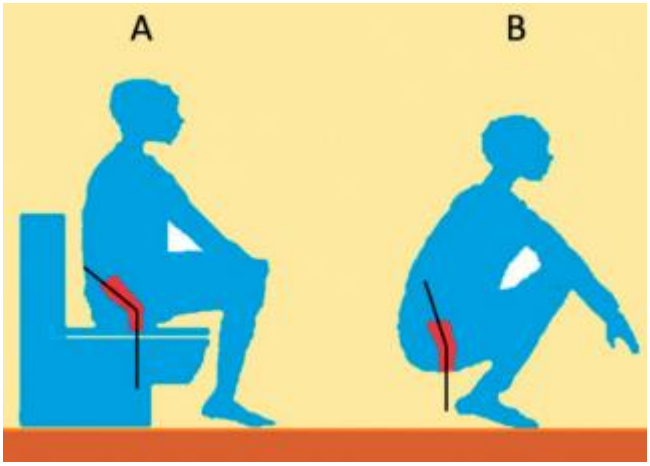


***Fig. 1.*** *Sitting (A) and squatting (B) posture while defecating. Source: www public domain.*

This raises an important question: have wealthier nations truly adopted a healthier, more physiologically optimal way of defecating, or have they simply prioritized convenience and aesthetics over function? When viewed through the lens of both evolutionary biology and contemporary medical research, the answer becomes clearer.

If we consider that anatomically modern humans (Homo sapiens) emerged around 300,000 years ago, the era of human coexistence with toilets accounts for merely 1.5% of our species' existence. This relatively short period suggests that our bodies may not have fully adapted to the changes brought about by modern toileting habits. Understanding the implications of this shift is crucial—not only for gastrointestinal health, but also for the broader relationship between human physiology, cultural development, and technology.

This paper summarizes and compares the findings of numerous researchers who have examined defecation posture from a variety of perspectives—not only through the lens of digestive health, but also in relation to respiratory function, pelvic floor mechanics, urological effects, and overall musculoskeletal dynamics. By presenting this multidisciplinary overview, the aim is to evaluate whether the modern seated toilet truly aligns with our biology, or whether we should reconsider the squat as a more functional and health-promoting position.

## 2. Research materials methods

This systematic review aimed at comparing two types of defecation postures: sitting and squatting, and their impact on health, specifically on digestive, musculoskeletal, and whole-body health. The research was conducted using PubMed, Google Scholar and ScienceDirect databases for the keywords: "defecation posture", defecation position", "squatting vs. sitting". All of the identified publications were included in the references and the credibility of the presented studies verified, and their conclusions compared and analysed.

## 3. Literature review results

Defecation posture impacts alike digestive, urinary, cardiovascular, and musculoskeletal health. The results of the various studies conducted in the years … were as follows.

### 3.1. Digestive health

Study performed by Sikirov (2003) performed on 28 volunteers (14 males, 14 females, age range 17-66 years showed that the time of defecation is the shortest in a squatting posture (less than 1 min), while at the sitting one the time is the longest (more than 2 min). While squatting the rectoanal angle straightness and converts the rectoanal outlet into a straight canal. Otherwise, while sitting the rectoanal angle is more sharp making the rectoanal canal more curled (see Figure 2).

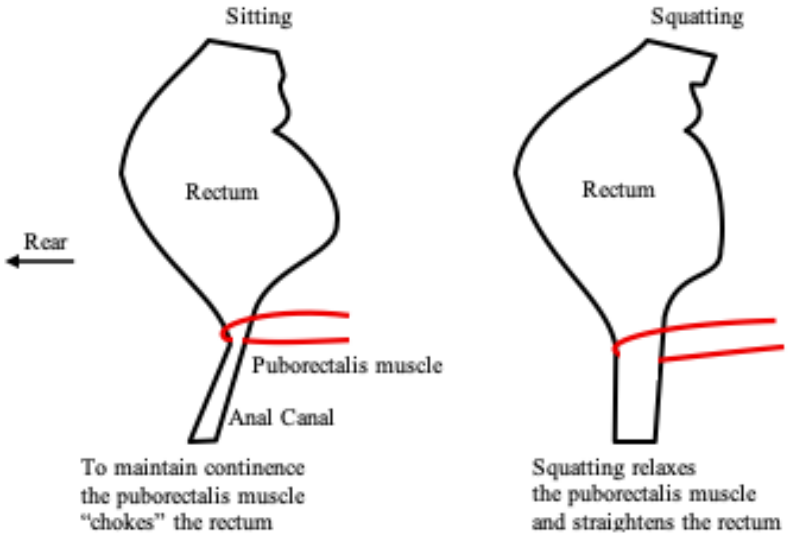


***Fig. 2.*** *Comparison of sitting versus squatting positions. Source: Own elaboration.*

Rane in his study (Rane 2003) concluded that squatting had positive effects on the defecation flow, and the time to maximum flow in comparison to a sitting position. Another study by Sakakibara (Sakakibara 2010) performed on 6 people compared three different positions: sitting, sitting with the hip flexing and squatting. The results where the same: the greater the hip flexion achieved by squatting the straighter the rectoanal canal was and the less strain was required for defecation.

Approach from the other side was taken by Edgar (Edgar 2017). His study concerned how different postures at standard Western-style toilets affect defecation. He found that using a footstool with a regular sitting toilet to simulate a squatting posture significantly improved outcomes. Participants 33 volunteers experienced: shorter defecation time (from ~113 seconds without a stool to ~55 seconds with a stool), less strain and effort, better satisfaction with bowel emptying.

Prospective study by S. Takano (2016), 22 patients (17 women, average age 56) with constipation who could not evacuate during standard sitting defecography were evaluated in a modified forward-leaning posture called "The Thinker" position. The results showed significant anatomical improvements: the anorectal angle widened from 113° to 134° ($p = 0.03$), the perineal plane distance increased from 7.1 cm to 9.3 cm ($p = 0.02$), and the puborectalis length extended from 12.9 cm to 15.2 cm ($p = 0.005$). Importantly, 15 out of 22 patients were able to completely evacuate in this posture, suggesting a meaningful functional benefit over the conventional sitting position

*Diverticulosis disease*: The study by Ozturk (Ozturk 2018) et al. investigated the link between toilet type and colonic diverticulosis (CD) in 757 patients (95 with CD, 662 without). Women were more common in the CD group (55.8%) and the average age was higher (62.1 vs. 53.8 years). Western (sitting) toilet use was significantly more frequent in the CD group (72.2% vs. 53.5%) and used for a longer duration (14.1 vs. 11.9 years). Multivariable analysis confirmed sitting toilet use and age as independent risk factors for CD. Squatting toilet users had a more balanced diverticula distribution, while Western toilet users had more left-sided disease. A 2024 study by Buldukoğlu (Buldukoğlu 2024) et al. included 929 patients and found that using a sitting toilet significantly increased the risk of colonic diverticulosis. Among those diagnosed with diverticulosis (8.7% of patients), 87.7% used sitting toilets while only 12.3% used squatting toilets. The study concluded that sitting toilets are an independent risk factor (odds ratio: 3.36, $P$ =.001) for diverticulosis development. This risk consequential to defecation posture was bigger than older age, male gender, smoking and ASA (Aspirin, acetylsalicylic acid) treatment.

*Colorectal cancer*: Study (Soharabi 2012), was conducted in Tehran, Iran. It involved 200 participants—100 colorectal cancer (CRC) patients and 100 control subjects matched for age, sex, and hospital of admission. The study aimed to investigate whether using sitting toilets (as opposed to squatting) is associated with an increased risk of CRC. The results showed no statistically significant association between sitting toilet use and colorectal cancer risk. Logistic regression analysis found adjusted odds ratios close to 1, indicating no appreciable increase in risk

*Hemorrhoids*: Dimmer (1996) concluded that there was no difference between sitting and squatting position as a risk factor of hemorrhoids. The same result was achieved in the Tuvalet research in 2022. It is a cross-sectional study that included 142 patients and aimed to investigate whether toilet habits (squat vs. seated toilet) are associated with hemorrhoid disease. The authors found no significant relationship between toilet type and the presence of hemorrhoids. However, hemorrhoids were significantly more common in male patients.

*Functional Constipation*: Gupta et al. (2023) conducted a hospital-based case-control study involving 300 Indian children (150 with functional constipation and 150 controls) aged 2–18 years to examine associations between defecation posture, diet, and constipation. They found that a significantly higher proportion of children with constipation used sitting toilets (71.3%) compared to controls (49.3%, $p < 0.001$; OR = 2.71, 95% CI: 1.61–4.59), and consumed a mixed diet (44%) versus controls (27.3%, $p = 0.003$; OR = 2.36, 95% CI: 1.39–4.01). Binary logistic regression confirmed both factors as independent predictors of functional constipation.

*Anorectal Bleeding*: Shekokar (2023) conducted a prospective comparative study to evaluate the impact of defecation posture on anorectal bleeding. The study enrolled 100 participants, equally divided into two groups: Group A, who used the squatting posture (Indian toilet), and Group B, who used the sitting posture (Western toilet). After 4 weeks of follow-up, 86% of patients in the sitting group showed improvement compared to 56% in the squatting group, a statistically significant difference ($p = 0.003$). The results clearly demonstrate that sitting posture is more effective than squatting in reducing anorectal bleeding.

### 3.2. Urinary health

*Micturition*: Yang, K.-N. (2010) conducted a study involving 45 healthy female university students in Taiwan. The study compared three voiding postures—sitting, semi-squatting, and crouching over—on uroflowmetry parameters and postvoid residual urine (PVR). While most uroflowmetric parameters and PVR did not significantly differ between postures, delay time to void was significantly longer in the semi-squatting position. Additionally, bell-shaped urinary flow curves were most common in the sitting posture (51.1%). Despite this, 88.9% of participants preferred non-sitting postures when using public toilets, mainly due to hygiene concerns. The study suggests encouraging proper sitting posture to support pelvic floor relaxation and healthy bladder function. However, the author reserved that the participants were young, healthy and the sample small. Another Rane (2014) study focused on how toileting posture affects urination in women. Among 49 adult female volunteers, the lean forward and near squat positions significantly improved urine flow rates compared to upright sitting. A separate survey of 125 women showed that squatting ability declines with age. The findings suggest that posture plays a key role in efficient bladder emptying. Moore (1991) also referred to this topic in his study of 528 gynecology outpatients and 155 urodynamic patients to assess toilet habits and their effect on urination. They found that 85% of women crouched over public toilet seats. Among 80 women tested, crouching reduced average urine flow by 21% and increased residual urine volume by 149% compared to sitting. The conclusion based on these studies was that the bigger anorectal angle the faster urine flow.

*Urinary tract infections (UTI)*: Study performed in Malysia by Parasuraman (2016) 551 Malaysian adolescents (mean age: 23.99 ± 6.04 years) participated in an online survey investigating the relationship between defecation posture and urinary tract infection (UTI) risk. The study found that 10.3% of respondents reported a previous history of UTIs, with females being more affected (38 cases) than males (18 cases). Importantly, individuals using a sitting posture for defecation were significantly more likely to develop UTIs (45 cases) compared to those using a squatting posture (12 cases). Additionally, the use of common toilets was associated with a 2.031 times higher risk of developing UTIs (95% CI: 0.936–4.406), suggesting a notable, though borderline, statistical significance. The findings also revealed that 43.2% of participants lacked adequate knowledge about UTIs, emphasizing the need for improved public education on hygienic toilet practices and the potential health benefits of adopting a squatting posture. However, The article by S.F. Farahani et al. (2011) investigates how different toilet designs contribute to infection risks. The study examined 61 public toilets to compare the hygienic implications of sitting versus squatting toilets. The researchers found that sitting toilets were associated with lower bacterial contamination levels compared to squat toilets. In particular, squat toilets without lids and poor ventilation showed higher rates of airborne and surface bacterial spread, increasing the risk of cross-infection. Although the study did not involve human patients, it provided environmental data suggesting that toilet structure and design significantly impact infection transmission in public settings. The authors recommended promoting the use of sitting toilets, improving ventilation, and installing toilet lids to reduce infection risks. Similar results were obtained in study performed in China by Ali

(2022). This paper investigated bioaerosol emissions from squat and sitting toilets by analyzing Staphylococcus aureus concentrations and conducting a quantitative microbial risk assessment involving 192 samples across eight exposure scenarios. The research demonstrated that squat toilets emitted significantly higher bioaerosol concentrations than bidet toilets, with peak levels reaching 1571.26 CFU/m³ for defecation posture under no ventilation, compared to 989.40 CFU/m³ in bidet toilets. Infection risks for adult males were 7.59–26.72% higher than other populations, largely due to greater breathing rates. Notably, health infection risks during defecation were 8.43–59.11% higher in squat toilets than in bidet toilets. Turning on ventilation significantly reduced bioaerosol concentration and risk, while hand washing posture showed 2.12–3.10 times lower infection risk than defecation posture. These findings suggest that bidet toilets with proper ventilation may offer lower bioaerosol exposure and health risk, supporting their use in shared indoor environments.

### 3.3. Cardiovascular health

*Strokes*: Chakrabarti et al. (2002) conducted a study involving three components. Part A analyzed 100 CT-confirmed stroke patients and found that 36% of strokes occurred while squatting, mostly during defecation, and over 52% occurred in the early morning. Among 41 haemorrhagic strokes, 51% occurred in the squatting position. Part B involved 67 healthy subjects (age 24–49) and showed a statistically significant increase in systolic blood pressure (SBP) of 8.09 ± 7.04 mmHg on squatting ($p < 0.00001$), but no significant rise in diastolic pressure. Part C studied 104 treated hypertensive patients (age 28–60), showing even higher increases in both SBP (14.46 ± 11.63 mmHg, $p = 0.0005$) and DBP (9.10 ± 9.19 mmHg, $p = 0.0008$) during squatting. The authors suggest squatting may induce hemodynamic stress, acting as a triggering factor for stroke in at-risk individuals.

### 3.4. Musculoskeletal health

*Pelvic nerve damage*: Lam et al. (1993) conducted a prospective study involving 52 patients to evaluate whether squatting during defecation reduces pelvic floor descent. Using a perineometer, they measured perineal position at rest and during maximal straining in three postures: left lateral, sitting, and squatting. The mean perineal descent during straining was −1.0 cm in the sitting position and −1.2 cm in the squatting position ($P = 0.27$), showing no significant difference between the two. Both sitting and squatting showed significantly greater descent than the left lateral position ($P < 0.01$). The study concluded that squatting does not reduce pelvic floor descent and likely does not protect against pudendal nerve damage associated with chronic straining

*Achilles tendon injuries*: Mir Mohsin et al. (2020) conducted a five-year prospective observational study at a tertiary care center in India involving 26 patients who sustained open tendoachilles injuries caused by slipping into squatting-type toilet pans. The majority (88.5%) experienced complete transection of the Achilles tendon, while 11.5% had partial transections. Notably, microvascular repair of the posterior tibial artery was required in 3 patients (11.5%) and of the posterior tibial nerve in 2 patients (7.7%). One patient needed microvascular free flap reconstruction due to extensive soft tissue necrosis. 88.5% of patients achieved good to excellent outcomes based on the Boyden score at one year, with 11.5% showing fair to poor results. The authors emphasized the danger posed by broken ceramic toilet edges and called for redesign of squatting toilets or replacement with safer alternatives such as Western or Taiwanese models. Another study performed by Dar et al. (2011) reported on 12 patients (9 males, 3 females) who sustained Achilles tendon lacerations after their foot slipped into an squatting toilet, causing the edge of the seat to cut the tendon. The injuries were all transverse lacerations, with 8 complete and 4 partial tears. Most patients (10/12) were satisfied with the outcome. Two cases (16.7%) developed postoperative infections—both had been operated on using an additional medial incision. These complications resolved after further interventions. The authors concluded that such injuries could be avoided by using sitting toilets and recommended minimal wound extension and local anesthesia to reduce infection risk and improve healing outcomes.

### 3.5. Seniors (elderly people)

*General health*: Snijders (2011) concluded that standard-height toilets (≈42cm) provide optimal pelvic alignment for efficient bowel movements. Raised toilets, though helpful for standing up, limit hip mobility and make defecation harder, especially in elderly users. Lower or squat-like positions (e.g. using footstools) improve bowel mechanics by straightening the anorectal angle and reducing strain. Thus, standard-height toilets with optional foot support offer the best combination of comfort, efficiency, and safety for defecation.

### 3.6. Ergonomics

Yu (2018) proposed a re-design combining ergonomic footrests and modified seat angles to better simulate the benefits of squatting while using a sit toilet. This design aims to reduce abdominal exertion and enhance user comfort without compromising health outcomes. Cai (1997) also addressed the topic of ergonomics but in squatting toilets. conducted a study in Taipei exploring ergonomic improvements for public squatting-type toilets. Their field survey of 100 individuals found that 86% preferred squatting-type toilets for better sanitation, despite 72% reporting leg numbness when using them. Interestingly, 46.5% of people avoided direct contact with sitting-type toilets, with many adopting a semi-squatting or full squatting posture even on Western-style toilets. An experiment with 80 college students showed that a 15° footstep slope resulted in the lowest increase in heart rate and received the highest subjective comfort ratings, indicating it as the most ergonomically favorable design.

## 4. Conclusions

The findings of systematic literature review of up-to-date research on defecation posture indicate inconsistencies in terms of methodology and health problems related to sitting and squatting position. Further research in this area using long-term clinical trials to avoid biases is recommended. The general conclusions from the studies so far are as follows:

Advantages of squatting position in comparison to sitting are:

- Evacuation of faeces is faster and more convenient.
- Prevention of “faecal stagnation” a factor of IBS, inflammatory bowel disease, and appendicitis.
- Reduces the risk of diverticular disease.

Advantages of sitting position in comparison to squatting are:

Better healing from bleeding from anorectal region.

### Authors Contributions

Conceptualization, G.Z.; Methodology, G.Z., M.M.; Validation, M.K., D.S. and J.K.; Formal Analysis, O.M., J.N.; Investigation, I.M., N.G.; Resources, T.T.; Data Curation, D.S.; Writing – Original Draft Preparation, G.Z., M.M.; Writing – Review & Editing, D.S., J.K.; Visualization, G.Z., M.K; Supervision T.T.

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