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# Impact of Religious Fasting on Resting Blood Pressure and Hydrogen Sulfide Bioavailability in High-Normal Blood Pressure Population



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**Abstract** | Hydrogen sulfide (H<sub>2</sub>S) has emerged as a critical gasotransmitter with significant roles in blood pressure (BP) regulation and cardiovascular health. Despite growing evidence from pre-clinical studies highlighting the vasodilatory effects of H<sub>2</sub>S, its role during fasting in humans remains unexplored. This study tested the hypothesis that religious fasting during Ramadan would reduce resting BP and enhance H<sub>2</sub>S bioavailability in individuals with high-normal BP. We examined the effects of a month-long fasting regimen on systolic BP and plasma H<sub>2</sub>S levels in fourteen adult Muslim men with high-normal BP (systolic BP 130-139 mmHg, diastolic BP 85-89 mmHg; *mean ± SD*: age 32 ± 5 years, body mass 85 ± 4 kg, height 1.7 ± 0.08 m). Baseline tests were conducted before fasting, followed by assessments on Day-1, Day-14, and Day-28 at two fasting durations (5 hours and 10 hours). The results demonstrated a significant reduction in systolic BP at the 10-hour fasting duration on Day-14 (mean decrease of 8.5 ± 3.2 mmHg) and Day-28 (mean decrease of 10.2 ± 3.8 mmHg) compared to baseline (*p* < 0.05). Additionally, plasma total H<sub>2</sub>S concentrations increased significantly on Day-7 (mean increase of 15.3 ± 4.1 μM) and Day-28 (mean increase of 17.8 ± 4.5 μM) compared to baseline and Day-1 (*p* < 0.05). These findings suggest that religious fasting can effectively lower BP and increase H<sub>2</sub>S bioavailability, providing a non-pharmacological approach to managing BP in high-normal BP populations

**Keywords:** *Fasting, blood pressure, hydrogen sulfide, gasotransmitter, cardiovascular health.*

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## I. INTRODUCTION

Hydrogen sulfide (H<sub>2</sub>S) plays a critical role in regulating blood pressure (BP) through its vasodilatory effects [1]. Despite pre-clinical evidence [2], the impact of H<sub>2</sub>S during fasting in humans remains unexplored. This study examines how religious fasting during Ramadan affects resting BP and H<sub>2</sub>S bioavailability in individuals with high-normal BP, providing potential non-pharmacological management strategies.

## II. METHODS

Fourteen Muslim men with high-normal BP (*mean*  $\pm$  *SD*: age  $32 \pm 5$  years, body mass  $85 \pm 4$  kg, height  $1.7 \pm 0.08$  cm) voluntarily participated in this study. Baseline tests were conducted pre-fasting, followed by assessments on Day-1, Day-14, and Day-28 at 5 and 10-hour fasting durations. The resting BP was measured [3], and H<sub>2</sub>S pools were measured using the monobromobimane method [4].

## III. RESULTS AND DISCUSSION

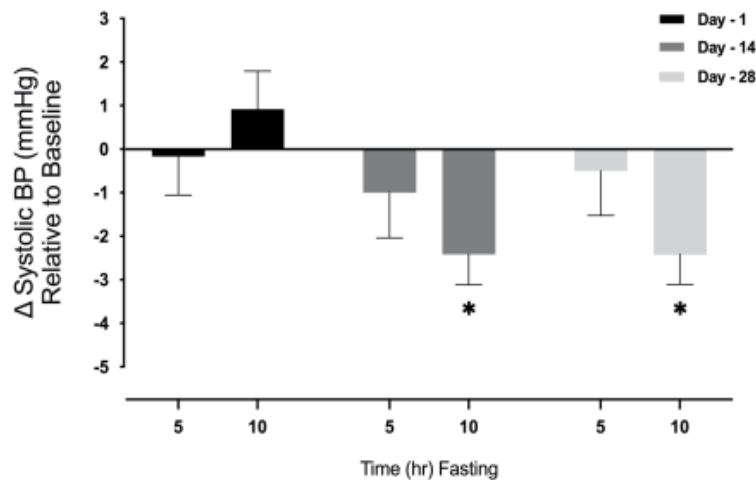


Fig. 1. Changes ( $\Delta$ ) in systolic BP relative to baseline at different fasting durations (5-hour and 10-hour) and different days (Day-1, Day-14, and Day-28).

Religious fasting significantly reduced systolic blood pressure (BP) by  $8.5 \pm 3.2$  mmHg on Day-14 and  $10.2 \pm 3.8$  mmHg on Day-28 at the 10-hour fasting duration ( $p < 0.05$ , Fig. 1). Plasma total H<sub>2</sub>S concentrations increased by  $15.3 \pm 4.1$   $\mu$ M on Day-7 and  $17.8 \pm 4.5$   $\mu$ M on Day-28 ( $p < 0.05$ , Table 1). The results support the previous study by [5], demonstrating that long-term fasting activity significantly reduces systolic BP. Additionally, the study's findings are consistent with [6], who reported an increase in H<sub>2</sub>S bioavailability with calorie restriction.

TABLE 1  
PLASMA (FREE H<sub>2</sub>S), PLASMA (ACID LABILE SULFIDE), PLASMA (BOUND SULFANE SULFUR) AND PLASMA (TOTAL H<sub>2</sub>S) AT DIFFERENT TIME POINTS AT BASELINE (PRE-FASTING), AND FOLLOWING FASTING AT DAY-1, DAY-7 AND DAY-28.

		Baseline	Day-1	Day-14	Day-28
Plasma [free H <sub>2</sub> S], μM	5-h	6.85 ± 1.01	6.80 ± 1.57	6.33 ± 1.40	6.59 ± 1.62
	10-h	6.63 ± 1.04	6.53 ± 1.26	6.18 ± 1.33	6.29 ± 1.46
Plasma [acid labile sulfide], μM	5-h	4.56 ± 1.07	4.96 ± 1.03	5.50 ± 0.63	6.00 ± 0.71
	10-h	4.63 ± 1.20	5.25 ± 0.93	5.79 ± 0.92	6.15 ± 0.83
Plasma [bound sulfane sulfur], μM	5-h	3.02 ± 1.21	3.14 ± 0.75	3.70 ± 0.82	3.77 ± 0.63
	10-h	3.29 ± 1.56	3.16 ± 0.95	3.61 ± 0.43	3.88 ± 0.74
Plasma [total H <sub>2</sub> S], μM	5-h	14.43 ± 1.49	14.91 ± 1.29†	15.53 ± 1.16†*	16.36 ± 1.74†*
	10-h	14.54 ± 1.33	14.94 ± 1.31†	15.57 ± 0.82†	16.32 ± 1.42†*

\* Significantly different from baseline. † Significantly different from Day-1.

#### IV. CONCLUSIONS

The study suggests that religious fasting can significantly reduce systolic BP in individuals with high-normal BP, potentially through increased H<sub>2</sub>S bioavailability, offering a non-pharmacological approach to managing BP.

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