



## An Internet Survey of Women with Unicornuate Uterus: Pregnancy Outcomes by Classification

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### Abstract

**Introduction:** Unicornuate Uterus is a rare uterine anomaly that currently has very little scientific research on the reproductive possibilities and experiences of women with this condition, the majority of research is done on individual case studies. This article seeks to gain a wider look at all of the reproductive complications that women with Unicornuate uterus encounter, and also to investigate if there are statistically significant differences between subclasses in regards to reproductive outcomes.

**Literature review:** Unicornuate uterus classifications have been found to have the poorest of reproductive outcomes. Studies have shown a live birth rate of only 29.2% in these women, a prematurity rate of 44%, and a 4% ectopic pregnancy rate. There are four subclasses of Unicornuate uterus.

**Methods:** The Mann-Whitney test was used to compare responses to survey questions designed to explore the relationship between specific Unicornuate uterus conditions and a number of variables associated with the ability to conceive, whether naturally or with the use of fertility drugs, numbers of pregnancies, numbers of miscarriages, length of pregnancies, whether or not bed rest was recommended and, if so, its duration, whether or not a C-section was performed, whether or not infants needed NICU care, and, if so, the length of their stay.

**Results:** Statistically significant differences between women with a communicating condition and those with a non-communicating condition were observed for four outcome variables: a) the ability to conceive naturally, b) numbers of pregnancies, c) numbers of births, and d) numbers of C-sections.

**Discussion:** Communicating subtypes appear to need less medical intervention in obtaining pregnancy, report a higher number of pregnancies and subsequently a higher number of births. Interestingly the non-communicating subtypes report a lower C-section rate.

13% are diagnosed with a Unicornuate uterus [4]. Because of the rarity of this particular uterine anomaly, women diagnosed are often given little information about their reproductive possibilities because their medical doctors are unlikely to have substantial experience working with this condition. Patients then are left to explore online information where statistics often report high incidences of repeated miscarriage, premature birth, and breech presentation [4,5]. The majority of scientific journal articles are independent case studies of success or loss, and only a few have looked at a large number of participants to analyze likely reproductive outcomes. The purpose of this study is to analyze a group of women diagnosed with Unicornuate uterus and identify the likelihood for successful pregnancies in some women with this anomaly, as well as explore the types and frequencies of complications. The research questions guiding this study are:

1. Is there a statistically significant difference between reproductive outcomes and the subtype of Unicornuate uterus diagnosed?
2. What concurrent fertility complications, such as first or second trimester miscarriages, breech presentation, premature delivery, bed rest, or necessity of neonatal intensive care, are most common in women with Unicornuate uterus?

### Literature Review

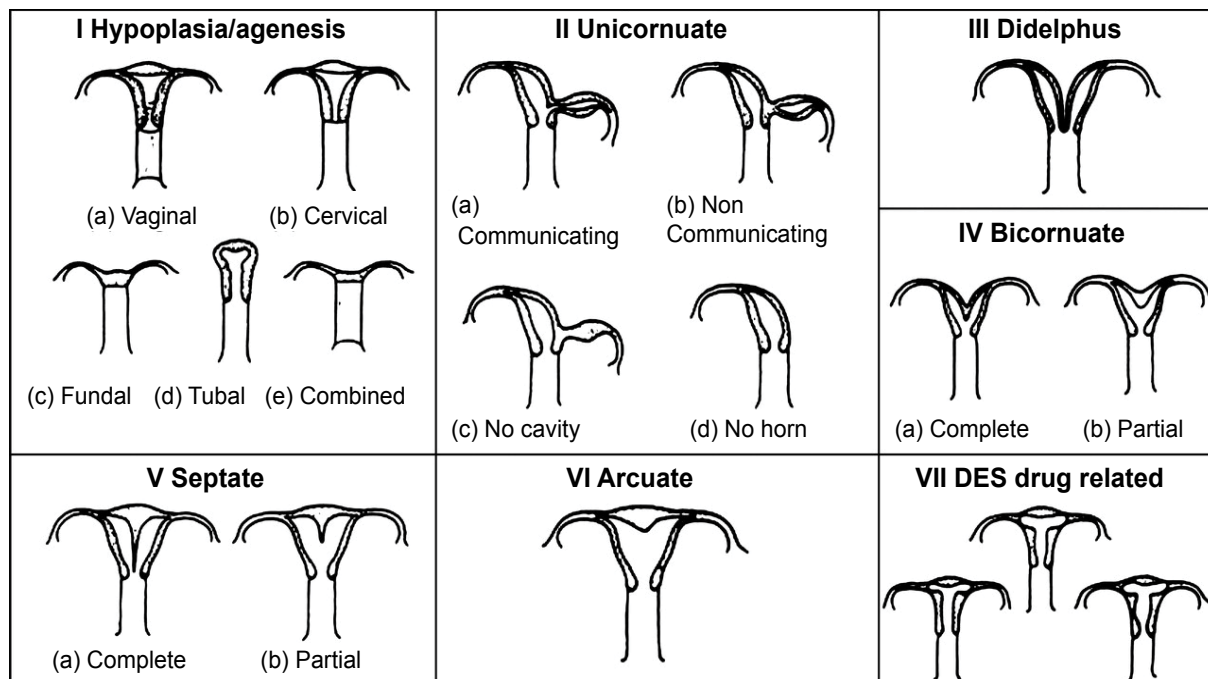
The American Society for Reproductive Medicine has developed a classification system for seven mullerian duct anomalies (Figure 1) [1-3]. Several classifications, including Unicornuate uterus have defined subclasses within them. Unicornuate uterus is divided into four sub classifications differentiated by the presence or absence of a rudimentary horn and its ability to communicate with the endometrium [3].

Unicornuate uterus classifications have been found to have the poorest of reproductive outcomes [1-6]. Studies have shown a live birth rate of only 29.2% in these women, a prematurity rate of 44%, and a 4% ectopic pregnancy rate [4-6]. Primary complications include first trimester abortion due to abnormal uterine blood flow, second trimester abortion due to decreased muscle mass and cervical incompetence, intrauterine growth restrictions, breech presentation, and premature delivery [4-6].

Few articles exist that examine reproductive prognosis based on diagnosed subtype of Unicornuate uterus. One report by Akar et al. [4] evaluated 55 patients diagnosed with Unicornuate uterus and followed

### Introduction

It is difficult to state the exact incidence of mullerian tract anomalies because normal reproduction is possible with many of the subtypes, and some women who may have these anomalies may choose to remain childless [1-3]. Literature indicates that mullerian anomalies may affect approximately 0.1-3.8% of the population [4]. However, a slightly higher percentage (3-6%) of the infertile population is diagnosed with a mullerian anomaly [3,5]. Of those,



**Figure 1:** Classification system of mullerian duct anomalies developed by the American Society for Reproductive Medicine.

them for two years. This study broke down the results of the pregnancies by subtype reporting that 38 of the 55 patients had 65 pregnancies during the two year study period. Of these, 19 live births were reported for a 29.2% success rate [4]. The majority of these, 13(35%), were in women with IIC classification, or non-communicating, no cavity. This classification however was by far the most represented as 44 of the 55 women belonged to this classification [4].

Of the classifications, it has been reported that the most common classification is IId or no horn at 35% [2,7]. Second most common is IIc, no cavity (33%), followed by non-communicating (22%), and finally communicating (10%) [2,7]. No studies have been found that indicate if a specific sub class has the highest success rate.

This article seeks to present a wider look at all of the reproductive complications that women with Unicornuate uterus encounter, and investigate the presence of statistically significant differences between subclasses in regard to reproductive outcomes.

## Methods

### Participants

Potential participants were first identified as the author became a member of three Unicornuate uterus online support groups after being diagnosed with a Unicornuate uterus. Women in the support group expressed frustration with the lack of current literature on this diagnosis and the fact that medical professionals often did not have answers. In order to gain insight, a survey was developed and approved by the Internal Review Board. Subsequently, an invitation to participate and complete an on-line survey was emailed to support group members.

The invitation to participate was emailed to 139 individuals. It explained the purpose of the survey, indicated it would take less than 15 minutes to complete, and included a link for easy access. A total of 80 women completed the survey, giving us a response rate of 56%.

### Demographics

Respondents were initially classified according to their Unicornuate uterus classification as follows: A) communicating, B) non-communicating, C) no cavity, and D) no horn. Of the 96 women who participated in the survey, 11 (13.9%) belonged to category A, 33 (41.8%) belonged to category B, 4 (5.1%) belonged to category C, and 31 (39.2%) belonged to category D. An additional 17 did not know

**Table 1:** Demographic Characteristics of Participants (N=96).

Characteristic	n	Percentage
<b>Unicornuate Uterus Classification</b>		
Communicating	11	13.9%
Non-communicating	33	41.8%
No cavity	4	5.1%
No horn	31	39.2%
<b>Age at Diagnosis</b>		
18 or younger	0	0%
19 - 23	8	10.1%
24 - 28	24	30.4%
29 - 33	37	46.8%
34 or older	10	12.7%
<b>How Condition was Diagnosed</b>		
During C-section	13	16.5%
HSG	42	53.2%
Laparoscopy	15	19.0%
Other	9	10.1%
<b>Which Side is Affected</b>		
Left	44	55.7%
Right	35	44.3%
<b>Number of Kidneys</b>		
One	11	13.9%
Two	58	73.4%
Unknown	10	12.7%
<b>Other Missing Organs</b>		
Yes	6	7.6%
No	73	92.4%
<b>Other Fertility Issues</b>		
Yes	34	43.0
No	37	46.8
Don't Know	8	10.1

which classification applied to them (these women were not included in any of the analyses).

Descriptive questions asked for age at the time of diagnosis, how the condition was initially diagnosed, which side was affected, whether both kidneys were present, whether any other organs have been diagnosed as missing, and whether or not additional fertility issues have been experienced. These data are summarized in [Table 1](#) below.

## Statistical analyses and findings

The Mann-Whitney test was used to compare responses to survey questions designed to explore the relationship between specific Unicornuate uterus conditions and a number of variables associated with the ability to conceive, whether naturally or with the use of fertility drugs, numbers of pregnancies, numbers of miscarriages, length of pregnancies, whether or not bed rest was recommended and, if so, its duration, whether or not a C-section was performed, whether or not infants needed NICU care, and, if so, the length of their stay. This non-parametric equivalent of the *t*-test was selected for three reasons. First, the distribution of responses did not meet the tests for normality required for parametric analyses. Secondly, Mann-Whitney was preferred over Chi Square because of the small sample size for the communicating unicornuate uterus classification. With only 11 participants, many of the expected counts in the Chi Square tests were < 1, producing unreliable results. Finally, many of the response options presented to participants represented either nominal or ordinal data, not interval data as required for a *t*-test [8,9].

Initial analysis yielded unconvincing results for the few women classified with condition C, having no cavity (*n* = 4). Since the sample size for this particular classification was too small to provide meaningful results, we decided to combine categories B, C and D (non-communicating, no cavity, and no horn) into a single group representing any non-communicating condition. This decision resulted in two groups. The first group had a communicating Unicornuate condition (*n* = 11) and the second group had some kind of non-communicating condition (*n* = 68). Obviously, comparing groups of such dissimilar sizes presented concerns about reliability. In order to increase confidence in our comparisons, several random samples of *n* = 11 were derived from the larger group by putting each of the classifications entry into a list and numbering each list. From there the computer generated a random choice from each of these lists to compare. This allowed us to compare results from equally sized groups to the results obtained from the complete set of data. Based on similar results from several of these sub-set comparisons, we believe it is informative for the medical community to proceed with reporting our findings. And finally, our decision to make comparisons

between women with a communicating condition and those with a non-communicating condition had the added benefit of limiting our comparisons to only two groups. Although analyses explored multiple outcomes, limiting the comparisons to only two groups also meant no post-hoc correction for an artificially inflated alpha (e.g. family-wise error) was required [10].

## Statistically significant reproductive outcomes

Statistically significant differences between women with a communicating condition and those with a non-communicating condition were observed for four outcome variables: a) the ability to conceive naturally, b) numbers of pregnancies, c) numbers of births, and d) numbers of C-sections. First, regarding the ability to conceive naturally, the difference between the two groups was statistically significant, with  $U = 254.0$ ,  $z = -2.035$ ,  $p = 0.042$ , and an effect size of  $r = 0.2$ . Women with a communicating condition were, in fact, 7 times more likely to conceive naturally than women with a non-communicating condition. Women with a communicating condition also had a statistically significant difference in the number of pregnancies, with  $U = 243.0$ ,  $z = -1.899$ ,  $p = 0.05$ , and an effect size of 0.2. Perhaps most striking in this analysis, women with a communicating condition were 3.7 times more likely to have had four or more pregnancies. Next, considering the numbers of births, women with a communicating condition were also statistically significantly more likely to exhibit a higher birth rate, with  $U = 230.5$ ,  $z = -2.153$ ,  $p = 0.031$ , and an effect size of  $r = 0.2$ . In the lower numbers of births (either none, or one) women with a non-communicating condition were 2.5 and 1.1 times more likely (respectively) to fall into these classifications, while women with a communicating condition were 2 times more likely to have two births, and 6 times more likely to have three births. Finally, considering the possibility of deliveries being performed by C-section, we found a statistically significant difference between these two groups, with  $U = 220.0$ ,  $z = -2.401$ ,  $p = 0.016$ , and an effect size of  $r = 0.2$ . Women with a communicating disorder were 3 times more likely to undergo a C-section during delivery than those with a non-communicating condition. These data are summarized in Table 2 below.

**Table 2:** Summary of Mann-Whitney Statistically Significant Results.

Outcome Variable	Mann-Whitney <i>U</i>	<i>z</i>	<i>p</i>	<i>r</i>	Odds Ratio Communicating Condition	Odds Ratio Non-Communicating Condition
Ability to Conceive with Fertility Medications	356.0	-0.304	0.7	0.03	1.2	0.8
Numbers of Miscarriages	346.0	-0.423	0.7	0.05	0.9	1.1
One					1.9	0.5
Two					1.3	0.8
Three					*	*
Four+					*	*
Week at Miscarriage	350.0	-0.369	0.7	0.04	*	*
1-5						
6-10						
11-15						
16-20						
21-25						
26-30						
31+						
Breech Presentation	292.0	-1.240	0.2	0.14	0.6	1.6
Need for Bed rest	295.5	-1.185	0.2	0.13	0.7	1.5
Weeks of Bed rest	313.5	-0.891	0.373	0.1	*	*
1-5						
6-10						
11-15						
16-20						
21-25						
26-30						
31+						
Need for NICU	253.0	-1.860	0.06	.2	0.1	.07
Duration of NICU	336.5	-0.798	0.4	0.09	*	*
1-2 days						
3-5 days					1.3	0.8
2-3 weeks					0.9	1.1
Month+					2.3	0.4

\*Insufficient data

**Table 3:** Summary of Mann-Whitney with No Statistically Significant Results.

Outcome Variable	Mann-Whitney <i>U</i>	<i>z</i>	<i>p</i>	<i>r</i>	Odds Ratio Communicating Condition	Odds Ratio Non-Communicating Condition
Ability to Conceive Naturally	254.0	-2.035	0.04	0.2	7.0	0.1
Number of Pregnancies	243.0	-1.899	0.05	0.2		
None					*	*
One					1.0	0.9
Two					1.5	0.6
Three					0.5	2.1
Four+					3.7	0.3
Numbers of Successful Births	230.5	-2.153	0.03	0.2		
None						
One					0.4	2.5
Two					0.9	1.1
Three					2.1	0.5
Four+					6.2	0.2
					*	*
Numbers of C-Sections	220.0	-2.401	0.01	0.2	3.1	0.3

\*Insufficient Data

None of the other variables included in our analyses demonstrated statistically significant differences, but the results of these findings are included below for informational purposes [Table 3](#).

## Discussion

The statistics show that there is a statistically significant difference between communicating and non-communicating subtypes in the ability to conceive naturally, numbers of pregnancies, numbers of births, and numbers of C-sections. Communicating subtypes appear to need less medical intervention in obtaining pregnancy, report a higher number of pregnancies and subsequently a higher number of births. Interestingly the non-communicating subtypes report a lower C-section rate. The major limitation to this research is that the participants were obtained through the online support group and came from all over the world and vary in time of discovery; meaning that some had been diagnosed years ago while others possibly days before the survey. Because of this, their individual knowledge about the specific subtype they have, their ability to read the survey accurately, as English may be a second language, and their knowledge about other comorbidities may be unknown at the time of the survey. Also, the women who were active on the online support group were there because they most likely had already experienced fertility or medical issues due to their condition. This could render this group of individuals to produce an over-estimation of pregnancy-related morbidities rate. Furthermore, there was only a response rate of 56% and while this appears low, the response rate is calculated from all members of each of the three Unicornuate uterus support groups. There was no way to tell which of the members were active or even received the message about the survey because some individuals may have become members years ago and while their profile still appeared and was counted, they may be inactive and never log on to the site. All active participants on the support group sites were eager to take the survey however because they were aware of the lack of knowledge about the condition and hopeful that this research might create new insights on this condition.

Conducting the survey via the internet provided the advantages of low-cost access to women with a vested interest in this medical condition, and meant we could collect quantitative data rapidly [11]. The author was aware of the potential disadvantages of using online access, but decided this would provide the most effective and efficient means of acquiring current data. Further, the potential for a low-response rate was offset by the fact this study was intended as a preliminary project, serving as the basis for a more in-depth study at a later date.

The reproductive comorbidities that these women reported, miscarriage, pre term delivery, bed rest, and necessitating a C-section reflects what current and past research identify. As explained before, no studies could be found that looked solely at women with a Unicornuate uterus and analyzed fertility outcomes by classification, most likely because of the rarity of the condition.

## Conclusion

Patients who are diagnosed with a Unicornuate uterus have little research available to help in making decisions about their procreation journey besides case reports of individual women. This research was intended to educate both medical professionals and women with this diagnosis on their likelihood of becoming pregnant and carrying a pregnancy to term. It also offers hope to all patients diagnosed with Unicornuate uterus that a successful pregnancy is possible with this condition, specifically if diagnosed with a communicating subtype. This information could also be useful and informative to physicians who are educating newly diagnosed women on their reproductive outcomes.

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